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CACAO CANKER IN CEYLON.

History of the Disease.

It is difficult to arrive at the exact date of the appearance of cacao canker in Ceylon: it had most probably being growing on cacao for a long period before it was noticed by planters. In 1896 it was generally noticed, and various theories put forward as to its nature, some favouring the view that it was caused by an insect, others that the methods of cultivation were at fault.

We may safely assume with our knowledge of the rate of growth of the organism causing the canker that it had been present in cacao trees at least five years previous to 1896, when in the public press and at planters' meetings the existence of the evil was recognized. The number of trees affected and the wide area over which the canker existed in 1898, when the investigation of its nature and life-history commenced, supports the presumption that cacao canker began in Ceylon not less than ten or twelve years ago. unhappily the disease was until 1898 only treated in various empiric ways, without definite knowledge of the nature of the eveil. It was said to he a fungus attacking the root, to especially attack weak trees, and to be a consequence of the attacks of boring and other insects, and from these premises various suggestions for the prevention of further spread of the disease were formulated. This has been almost invariably up to the present time the history of diseases of cultivated plants, and the experience has been dearly bought that in plant life, as in human sanitation, sporadic diseases should he carefully investigated as soon as possible, and when their nature is discovered prompt measures taken to prevent them becoming epidemic.

In 1898 I began an investigation into the causes of the disease, spending a year in observing the life-history of the fungus causing the mischief, and also in visiting and examining more than forty cacao estates in different districts of the Island and at various elevations (from 100 to 4,000 ft.). The results of this investigation were published in three reports by the Ceylon Planters' Association, and an abbreviated account, with rules for dealing with the canker, was printed in Singhalese and Tamil and circulated by the Government.

The amount of damage done before any steps were taken to combat the evil is hard to estimate, but a most serious loss in crop was caused by the canker and a still more serious loss of trees; some estates, for reasons which may perhaps be understood by the following account, were free, or almost so, from the disease, while others were entirely, or in great part, wiped out.

Had the organism causing the disease invaded the root—as it was erroneously supposed to do—as well as the stem of the cacao trees, the loss would have been more disastrous. When the stem was cut down suckers were produced from the stump and grew vigorously, without disease, producing fruit, in some cases when only a year old, in addition, new plants supplied grew healthily b side the stumps of the old cankered trees, and these circumstances retrieved a great deal of the loss on many estates.

On some estates the methods laid down for combating the spread of the disease have been most carefully carried out, on some others partial trials (which, as a rule, are a mere waste of money) have been made, but in a large number of cases, notably native holdings, no measures have been taken to decrease the ravages of the disease.

Since I have taken up my duties as Government Mycologist I have more than once had inquiries as to a "new disease" noticed, which on specimens being sent proved to be typical canker, and from its hold on the trees and the number attacked must have been present in the state for many months, probably even years.

That there are also many false impressions current as to the nature of this disease appears in letters of inquiries received as well as in the local newspapers, which show that some of the facts recorded in the reports issued by the Planters' Association have been misunderstood. The object of this Circular, therefore, is to recapitulate the knowledge gained by the investigation and to record observations and experiments carried on since the reports were published.

It is to be hoped that every cacao planter, especially those whose experience and observation has given them definite views on the question, will read and carefully consider the evidence and the facts deduced therefrom.

The methods employed in gaining these facts are described with a view to encouraging planters to gain for themselves knowledge, not by general observations recorded only in the memory, but by experiments and observations—simple perhaps in themselves, but conducted carefully and the results permanently noted.

It say here be stated that, for reasons which our readers will readily understand, the names of states where the various observations mentioned in this Circular were made are not given, yet these cases, like the inoculation and other experiments, are not mere general observations, but exact instances, of which the place and conditions were recorded at the time of observation.

EXTERNAL EFFECTS OF CANKER.

The first question in investigating any disease is —What is the nature of the departure from the normal health of the trees? Briefly, in the disease in question the external signs are a lack of vigour in producing fruit and leaf, similar in its appearances to the lack of vigour caused by long periods of drought or by severe mechanical injuries to stem or root. The period during which the treo continues to exist depends on the amount of disease on the tissues and the quantity of nutrition the roots can take up. The fact that trees of all varieties, at all ages above three or four years and in some cases less than that, in the best soils as well as on poor land, in various aspects and at different elevations, are attacked naturally leads to the supposition that this disease is not due to conditions under which the trees are growing, but to the effects of an extraneous parasitic organism.

No injuries caused by insect or other animal can be found exclusively on diseased trees, so that the disease cannot be due to the attacks of an animal. The next point is—What portion of the tree, if not the whole tree, is affected, and in what manner? The roots of badly diseased trees show no sign of injury, and when the tree is cut down near the ground healthly suckers are formed, which grow without any sign of disease. These, as well as many other facts which will appear in the course of the Circular, show that the root is not affected by the disease, and it is indeed a happy thing for the cacao planter to be assured on this point, as root diseases are much more difficult to battle with, and consequently much more to be feared.

The leaves of diseased trees, except in rare cases, are free from fungi, and present on microscopic examination all the features to be found in leaves dying from want of moisture, showing that there is no disease in the leaf, but that some malady in another part of the plant has cut off their supply of nutrition from the root.

The stem and branches must now be examined, and here it is not hard to find the cause of the disease. If we examine the external bark of the stem and branches of diseased cacao trees, we shall notice darker patches, where in some cases (where there is an injury in the bark, and insect puncture, or an abrasion) claret coloured drops exude, and where they have run down and dried up a rusty coloured streak is seen. On scraping these darkened patches the bark is found to be discoloured, sometimes of a deep claret hue, but in earlier stages of a brownish or "neutral tint" colour, quite evident if these places be compared with the yellow or reddish yellow colour of healthy cacao bark. This discoloured bark is always very wet, and on being cut exudes copious moisture—the darker the colour the more the moisture—and feels soapy to the touch. If such a diseased patch be carefully shaved, its difference from the healthy bark surrounding it can be clearly seen, as it stands out as a bright claret coloured patch surrounded by the light yellow healthy tissue.

MICROSCOPIC CHARACTERS OF THE DISEASE.

A microscopic examination of the tissue in these discoloured parts shows a quantity of mycelium of a fungus permeating the tissue.

Mycelium is the vegetative portion of a fungus, that is to say, it is to a fungus what the root, stem, branches, and leaves are to a flowering plant. The quantity of mycelium is much greater in the darker coloured parts than in those of a neutral tint, and in cases where the discolouration is only just perceptible the mycelium is scanty.

The mycelium also penetrates into the wood of the stems and branches, running generally in a longitudinal direction. It can be observed when it is present in any quantity as a thin black strand as thick as a piece of cotton; this strand may crop out into the bark at another place higher up or lower down, and produce a fresh cankered spot on the bark. The time the fungus takes to kill a tree or part of a tree depends upon many conditions. It is possible for it to produce death in a few months: as a rule it takes two or three years. Death occurs when there is sufficient mycelium to prevent any sap being conveyed from the roots to the parts above.

To return to the external appearance of the cankered tree. If we observe a number of patches of disease we shall find on many of them whitish pustules on the surface of the bark, varying in size from that of a pin's head to a ten-cent piece white gray or pinkish gray in colour, and bursting through small ruptures in the bark. If these be examined microscopically they will be seen to consist of masses of oval-shaped bodies, and some larger bodies crescent-shaped and septate, *i.e.*, having a number of partitions, usually eight. They are the spores of the fungus, and a section cut through the centre of one of these masses into the discoloured bark will show that they are produced on the mycelium which permeates the tissues. Spores may for purposes of popular explanation be considered as the seeds of the fungus. These spores are excessively minute; some notion of their size may be gained by the rough calculation that about five million could be placed on a ten-cent piece only one layer thick; those which are crescent-shaped are larger, being about six times the size of the oval spores.

When these spores are sown in a suitable medium and kept moist (a form of microscopic gardening which must be always used in gaining a knowledge of these small organisms), in the course of twelve or fifteen hours they begin to grow, pushing out a tube, which, as it grows, branches, frequently coalescing with neighbouring branches, and in about fifty hours producing more spores similar to those from which it originated. This minute gardening is of great interest, but it is of less practical value than observing the processes of growth in the living cacao tissues (which is unfortunately impossible), because the nature of the "bed" in which the spores are growing affects the rapidity and character of

the mycelium, and in a good nutritive solution the conditions of resistance to growth and the amount of food available are much more favourable than in the bark tissues of cacao. On carefully searching diseased and dead cacao trees, and especially those which have been attacked for a long period, we shall find a third form of spore enclosed by a fruit wall, which is very characteristic in colour and size. These fruits are of a bright crimson colour, and occur in clusters about the size of a pin s head; if looked at with a lens, they will be seen to be in shape and colour like a strawberry, minute in size, about twelve or fifteen making a mass equal to a pin's head.

These are the fruits or perithecia of the canker fungus, the name of which, botanically, is Nectria, and they are hollow spheres containing a series of sacs or "asci," which in their turn contain each eight spores. They are to be found only on dead wood or dead patches of dying branches and stems.

The name "canker" is not strictly correct, though it may be used, as the other Nectrias parasitic on trees are "cankers." Properly a canker is a diseas causing malformation of the tree at the point where the fungus is. In the case of the cacao Nectria, however, no such excerscence or other irregularity occurs, the contour of the stems of cankered trees being the same as those unaffected by disease.

This completes the life-story of the canker fungus: the small oval spore producing mycelium, which in its turn produces spores of three kinds: first the oval and crescent-shaped spores in whitish masses, and then the ascospores enclosed in crimson spherical fruits.

INOCULATION EXPERIMENTS.

We have a fungus which will account for the diseased condition of the cacao tree, but in order o prove absolutely that this organism is the chief and only cause of the canker, it was necessary to artificially produce the symptoms of the disease by inoculating a previously healthy tree.

The table on page 322 gives a record of thirty-two inoculations made on previously healthy trees in full vigour, showing the variety of the tree experimented on, the material used to infect it, and the time occupied before the characteristic symptoms of the disease were produced. As will be seen, twenty five out of thirty, or more than 80 per cent., of the trees inoculated acquired the disease, the majority showing unmistakeable symptoms after eight weeks.

As would be expected the inoculation of diseased tissue produces a cankered spot sooner than the sowing of spores in the bark, just as in the case of the production of new plants from cuttings instead of seeds.

The time taken to affect a certain area of the bark is very variable; in the case of quickest growth (No. 13) a space of nearly 10 inches long by 4½ inches wide was permeated and discoloured by the fungus in five weeks, while in the one of slowest growth a piece not larger than a rupee was diseased after ten weeks. The spread of the canker fungus in the bark depends upon the amount of sap in the tree at the time, and in a vigorous tree where the roots are taking up plenty of nutrition the diseased spots increases more rapidly, because the mycelium of the fungus obtains more food. From the table it will be seen that in the cases of inoculation of suckers only one out of three cases succeeded. This fact and observations as to the comparative rarity of canker on suckers led me to make further observations and experiments in this direction. I examined 200 suckers on 135 trees, most of which (113) had disease on stem and branches, and in only five cases were the suckers cankered. I also inoculated thirty suckers, and in only twelve (40 per cent.) was canker produced.

The smoothness of the outer bark on suckers and the fewness of wounds and abrasions give less chance for the lodgment and subsequent growth of the canker spores. This, together with the fact that even when it has a footing the spore does not invariably grow on them, make the "suckers" of more value than other brances. In cankered estates, therefore, whatever method has been previously practised, it will be well to spare the sucker. In the limits of the Circular, though it may be treated in a subsequent one, it is not possible to discuss the *pros* and *cons* of pruning for fruit in cacao. Dealing with the matter from the point of view of combating the canker, the use of the knife, or, still worse, the nipping or tearing off suckers, leaves a vulnerable spot for the cacao spores, and since the suckers are more protected from canker than other parts, it is well to allow the tree to produce these branches, which like the lateral branches, bear their fair proportion of fruit. We have seen that the roots and leaves of the cacao tree could in no case be found affected by the canker fungus, and in order to still further prove this point I made some inoculations of exposed roots and of underground roots; seventeen cases were inoculated, nine exposed roots and eight in which the earth was temporarily removed, but in none of them was any canker produced. I also attempted to get the spores of the fungus to grow on the leaves by sowing them on both the upper and under surfaces and by scraping the epidermis away and then introducing spores. Fifty of such experiments produced no growth of the canker, so that we may definitely state that the canker does not affect roots or leaves.

DISEASE OF THE PODS.

The fruit, which has so far not been mentioned, cannot however be so classed, for upon it the fungus grows vigorously. For many years the great loss of pods in various stages of maturity has been a serious question. To understand the pod disease it must be stated that there are a number of causes why large numbers of pods which are set do not reach maturity. There are in many trees hundreds of pods which blacken, dry, and shrivel up when they are from 2-5 inches long; in these there is no specific organism causing disease to be seen, and this is a physiological effect, it is an evil which I am continually observing and investigating, and all exact knowledge as to its nature is of importance, as leading us nearer to some way of preventing this immense loss of energy in the fruit-producing power of the cacao tree. The planter is satisfied, as a rule, with the comforting explanation that the tree has set more fruit than it can bear, and as he has frequently in his mind a dread of what is called "over-bearing," he is not much distressed at this waste. This Circular, however, treats of the canker, and further discussion of drying of young fruits must be deferred.

The attacks of insects and other animals cause the death of many pods. From the squirrel to the *Helopeltis* many animals feed on cacao pods or lay their eggs in them; but of these I have no authority to speak, they are dealt with by my colleague, the Government Entomologist.

The canker fungus is, however, responsible in many estates for a very large loss of crop. The disease can be readily recognized on the pod. A characteristic discolouration accompanied by an excess of moisture which gives a slimy feeling to the touch when cut, and as in the bark the colour is darkish brown, and a clear line can be drawn between the healthy and the diseased parts. The disease attacks the pod most frequently either at the point or at the stalk; this is due to the fact that a drop of moisture in which the spore can germinate often hangs on the point, and the cup formed round the stalk holds moisture which aids the growth of the spore at that end of the pod. The life-history of the canker fungus on the pod

is similar to its progress in the bark, except that it is much shorter. We have seen that under favourable conditions the time taken from the germination of the spore to the production of new spores in the bark is a question of some weeks and often months, but the whole of this is passed in the pods in a few days, and vast numbers of spores are produced in every pod that is allowed to hang on the troc for a week or more.

The diseased tissue of the pod if examined microscopically will be found to be permeated in the same way by the mycelium of the fungus, but this mycelium is of a more luxuriant character, because there is more moisture in the pod for it to grow on and less resistance to its growth.

If a planter wishes to observe for himself the life-history of the canker fungus, he can by placing a cankered pod under a glass and keeping it from drying up see the production of the two early forms of spore (gonidia), and later the red spherical bodies of perithecia containing the ascospores.

That the canker fungus grows on the pods has been proved by numerous observations, and in order to test by inoculation I experimented with twenty pods of fairly typical Red Cacao trees and twenty of *Forastero* trees. These I inoculated with both gonidia and ascospores, seventeen of each variety being painted with gonidia spores and three of each kind with ascospores. In the case of the Red Cacao all the seventeen grew at once, twelve in the first three days and the rest within eight days; in the *Forastero* twelve grow within nine days, the remaining five did not acquire the disease, the fact that the typical *Forastero* fruit has a thicker epidermis or outer skin no doubt gives it a greater power of resistance to the growing spore of the canker fungus.

On all these inoculated pods the spores—both gonidia and ascospores—of the fungus were produced in from four to nine days, and these spores were exactly similar in character to those on the bark.

RELATION BETWEEN POD AND STEM DISEASE.

In order to prove the relation between the canker on the bark and on the pods, and how far the one spreads to the other, the following experiments were made:—

(1) Small pieces of cankered bark were placed in selected healthy pods on sound trees. Five pods were so treated. In all cases the pods became diseased after eight days, and in less than fourteen days spores of the fungi were produced in abundance.

(2) Small pieces of diseased pods were placed in the bark of sound trees. Eight of these inoculations were made. In all cases canker was produced in the bark after ten days, and the spores of canker were found after eighteen days.

(3) Small pieces of cankered bark were placed in the bark of sound trees just above the stalks of healthy pods. Seven inoculations were made. In all cases the bark became diseased, and it spread to the pods, which were plainly diseased, in nine days, and spores produced both on the pods and on their stalks.

(4) Pieces of diseased pods were placed in healthy pods on sound trees. Six of these inoculations were made. All the pods became diseased, and in three cases the canker spread through the stalk to the adjoining bark; in the other three cases the stalks of the pods were cankered, but not the adjacent bark. In one case the mycelium of the canker went through in to the wood of the tree through the stalk without affecting the adjacent bark.

Wo learn from these experiments that the canker fungus can spread from the bark of stems or branches to the pods; that the fungus can spread from the pod to the bark of stem or branch.

Another matter of interest in connection with the disease on tho pods is that they are invaded by another fungus *Phytophthora, sp.*, one which is common in many climates and grows on the soft tissues of numerous plants On examination of some hundreds of diseased cacao pods I always found this fungus associated with the canker fungus. I was unable to get a pure culture of the spores of the second fungus, so that I could not observe the action of the *Phytophthora* alone on the pod. The canker fungus I have found by itself on the pod, but in the great majority of cases it is soon joined by the *Phytophthora*, and this latter I have never found by itself in the pods in nature.

A very large series of observations of the relation between the canker in the bark and on the pods shows that in a certain proportion of cases the canker originates in the bark from a cankered pod which has been left on the tree sufficiently long—three or four days—to enable the mycelium to penetrate through the stalk; also in a smaller proportion the canker in the pod has been caused by the mycelium growing from the bark through the stalk and infecting the pod.

To sum up the knowledge gained by this investigation of the cacao canker. The disease is due to a fungus (Nectria) growing in the bark "wood" and pods of the cacao tree. It spreads by means of an abundant production of spores of three kinds. It grows more rapidly on the pods than in the bark, and its rate of growth in both cases is regulated by the amount of sap in the tissues.—*Royal Botanic Gardens, Ceylon.*

(To be concluded.)

SOME RECENT INVESTIGATIONS IN THE CHEMISTRY OF AGRICULTURE.

(Continued from page 381.)

SOIL MOISTURE.

I must now refer, though with great brevity, to another department in the investigation of soils, namely, the *Moisture conditions.*

This subject has a particular interest in India where the rainfall is unequally distributed.

Some parts of America suffer likewise from an unequal distribution of rainfall, and Professor Whitney of the U.S. Department of Agriculture, has for some years devoted his time to an examination of the moisture conditions which obtain in soils. Although his work bas already been productive of most valuable and interesting information, it is at present in its infancy, and it is impossible to say what this department of research may eventually tell us. But some of the information gleaned is of great interest.

In the first place, mechanical analyses of soils made by Whitney, Hilgard and others, have demonstrated that it consists largely of very minute particles, many of them measuring only a few micro-millimetres in diameter, some indeed being even smaller than this, or to put the statement popularly, they are little larger than bacteria. In loamy soils about one-half of the silicious matter consists of such material.

The result of this state of minute sub-division is that it offers a very large surface, not only to the plant, to whom it is important, but also to the water! Perhaps will appreciate this if I say that each cubic foot of soil offers a surface area amounting to many thousand square feet. One of the results of this is that water is held, long after rain has ceased to fall, in very thin films on the surfaces of these small particles, and does not at once evaporate into the air or run away as drainage water, as would be the case if the soil consisted of coarse pieces.

Turning from the soil for a moment, we may enquire how much water an ordinary crop will require during its growth. This is a much larger amount than one might suppose. The results of the most recent investigations go to show that the quantity varies from about 300 to 500 lb. of water per 1 lb. of dry crop. For example, an average good wheat crop

at Cawnpore will weigh (corn and straw) about 4,500 lb. per acre in the dry state, and such a crop will require something like 1,800,000 lb. or roughly 800 tons of water. Or again a cholum crop, including stems, leaves and grain, may weigh from 4,000 to 7,000 lb. in the dry state, and such crops will require 2,000,000 to 3,500,000 lb. of water, or say 1,000 to 1,500 tons.

These are of course very large amounts, but when we state them in terms of rainfall, they are not so very surprising. The former is equivalent to 9 inches and the latter to about 10 inches to 15 inches of rainfall. One would be inclined to ask why even more than this rainfall is necessary in order to grow heavy crops. If the rainfall were well distributed over the seasons, it would indeed go much further towards satisfying our Indian crops than it does, but unfortunately it is apt to fall in heavy showers, and a part runs off the land, whilst there is always some lost by drainage, the latter being indeed a necessary condition for all healthy soils. It follows however that, in order to grow heavy crops, even larger amounts of water are required than the few inches I have spoken of.

It is necessary therefore that the soil shall hold, for periods of weeks and months, very considerable quantities of water, and this it does in the manner I have indicated, namely, as a very thin film on the surface of the soil particles.

A further part of Whitney's work consists in the determination of that proportion of moisture, or to state it popularly, that degree of dampness of any soil, which is most suitable to the crops grown. I have already told you that these investigations are merely in their infancy, and I cannot do more at present than to say that there is every probability of reaping a rich harvest of information.

In some soils, crops will grow best with very much less water than in others. The following examples will better show the importance of the work.

One soil was found to be too wet with 10 per cent. of water to be too dry if the proportion fell below 5 per cent. and that the crop fared best with from 5 to 8 per cent. In another case, the soil was too wet if the moisture rose to 25, and it was too dry with 15 per cent.; in yet a third case 23 per cent. of water was too little.

What this line of research may ultimately indicate, it is of course impossible to say, but one thing seems probable, namely, that although we cannot alter the rainfall, it may tell us in what manner we should irrigate our land, so as to produce the best crop with the least waste of water, and without damage to the land.

SEWAGE.

The last subject which I shall refer to is the so-called biological treatment of sewage. It may appear at first sight that this matter belongs rather to the domain of the sanitary engineer than to the agricultural chemist. As a matter of fact, the disposal of sewage should engage the attention of both. To the one the question is—"How am I to get rid of this material at any price, and with the least possible amount of nuisance to the inhabitants?" Whilst to the other, the deposition of such matters in the soil, means an increased manure supply.

That the land is the proper destination for the town "night-soil" has been admitted by all who have had to answer the question, but when the practical details of the working arrangements were taken in hand, the difficulties proved great. In many parts of Europe, America, and in fact wherever the sanitation of towns has been seriously taken in hand, the excrementious matters have been conveyed down closed sewers by water and emptied, with, or without previously "purification," into the nearest river, and sanitary authorities have been very well satisfied if they could do this successfully.

The regular return to the land of those matters which had been withdrawn from it, although so desirable, has been considered as generally impracticable, and has had to be classed among the many other interesting problems which remained unsolved. To sanitarians and to agriculturists alike, therefore, the discovery of a means of disposing of sewage without causing any nuisance whatever, void of technical difficulties, with a minimum of cost, and including as an integral part of itself, an effluent which no one would object to put on their flower garden, much less on their fields, has come as a matter of unusual interest. It is now, of course, a very old story, that animal and vegetable refuse matters of all kinds disappeared when allowed to remain in either water or the soil, and that this resolution is effected by lowly organisms which are commonly spoken of as "microbes," better known to the scientific world as moulds, yeasts, fungi, and bacteria, organisms small of stature, but performing nevertheless an all-important work. For many years attempts were made to utilise this army (for the number of such organisms is very large), for the disposal of town refuse. It was argued that because these matters do disappear if left in either soil or water, then why not put them on the soil or into the river? And for a long time this procedure has been followed, but with the result, that in the majority of cases the river was rendered foul, or the land unapproachable. There was clearly something very wrong in our method of utilising the services of the wily microbe.

For the last 10 years, however, efforts have been concentrated by a number of investigators on the value of what is termed the "Biological Filter." The general meaning of the term "Filter" is a porous medium, through which a liquid will pass, but which will arrest solid matters, and prevent them flowing on with the liquid. Thus we use blotting paper in the chemical laboratory to separate our precipitates. Drinking water (with the idea that only solid substances did us harm) has been filtered through such things as sand or charcoal, or more recently by the aid of the Pasteur cylinder of finely porous earthenware. The "biological" filter is, however, in reality very different, at least in principle. It consists, it is true, of such material as broken charcoal or stones, but there is no attempt to make it imprevious to the passage of fine solid matter. It had indeed become recognised that at least one of the reasons why the soil of the sewage farm did not purify its daily allowance of sewage, was because it was too fine, and contained too small an allowance of atmospheric oxygen, resulting in harm to the army of microbes which it was hoped would consume the sewage. The idea of the biological filter was then to offer to the sewage as larger a surface as possible, with, at the same time, plenty of air. Liquid sewage run into such filters (which had been previously aerated) and allowed to remain in them for a few hours, was found to have lost one-half or more of its organic matter.

The Massachusetts Board of Health, in the U. S. A. and Mr. Dibdin, and Mr. Scott-Moncrief in England, must be named among those who carried out the first experiments in this direction. At first, only a comparatively weak sewage was run into the biological filter, but the process worked so exceedingly well, that very shortly these filters were supplied with the raw and unadulterated sewage, in the hope that this might be equally palatable and digestible to our friend the microbe. And indeed it was found to be so. The solids of the crude sewage disappeared, that is, they were dissolved and broken down, and this, as also the matter already dissolved in the sewage, actually disappeared to the extent of about 85 per cent. It thus became evident that the microbe could be persuaded to perform his duties most efficiently, if the sewage were only given to him in a proper manner.

Before telling you anything more about the form of the biological filter, or its analogue the Septic Tank, I must digress to say a word about micro-organisms generally.

In the first place, as you know, they consist of

minute cells, having a very brief individual existence. They are divided into groups, such as moulds, algæ, fungi, yeasts and bacteria, and it is principally those of the latter class with which we have to deal. An important point in the life history of Bacteria is that, whilst some of them thrive in the presence of a plentiful supply of atmospheric oxygen, others have a more healthy existence in its absence. The former are called ærobic bacteria, the latter anærobic bacteria. Another point is that they all live on food of complex character. Whilst the higher plants feed on very simple foods, such as carbonic acid and nitrates, building up from these the complex compounds, carbo-hydrates, oils and albumens, these lowly organisms perform the reverse operation, and, feeding on complex material, break it down, with the production of simple substances, some of them proceeding so far as the production of carbonic acid and nitrates. Furthermore, whilst one organism will prefer the most complex material as food, producing therefrom simpler substances, others have a particular appetite for these simpler substances and reduce them to compounds of a still more simple constitution.

It is indeed, as has been mentioned in a former part of this lecture, owing to the existence of myriads of such organisms, that the vegetable and animal matter, which accidentally or by the agency of man are annually deposited in the surface soil of our fields, rapidly disappear and become changed into the simpler compounds on which the higher plants feed.

The action of these bacteria has very pertinately been likened to that of a child, who after assisting in building up a castle from a pack of cards, proceeds to take a card first from one part of the structure, then from another, with the result that the castle is rapidly converted into a heap of cards again.

Finally, I must refer o another characteristic of these organisms, and that is, they don't like their food to be too concentrated. If they have too much, they suffer in the same way, as a boy does who eats too many sweatmeats at once. They get ill and may die, if the excessive food supply is persisted in. This really explains why the sewage farm has been a nuisance instead of a blessing. Vast quantities of matertal have always been poured upon a small area, without any consideration for the health of our microscopical friends, and the result has been that they couldn't perform their duty satisfactorily, and the sewage farm proved a failure.

We may now return the biological treatment of sewage, with a clearer understanding of the conditions involved in its arrangement. For it to proceed satisfactorily, we must offer the material to these organisms in such a manner that each class may perform its appointed task—the anærobic organism prefers to be without air, the ærobic microbe must have an abundance; the food must also be in a reasonably diluted state; and thirdly, we must not upset the home or colonies which these classes make for themselves, for they sort themselves out, and one class will inhabit one spot in the biological filter, another class another, and if we give crude sewage to the class which lives on the partly simplified material, the result will be destruction, not to the sewage but to the microbe.

Thus in the case of the filter which Dibdin, Scott-Moncrief, Garfield and others have used, the crude sewage passes first into one vessel, which Mr. Scott-Moncrief has called a "cultivation tank." This is simply a large tank filled with broken brick or some other coarse material. Here those organisms which prefer the more complex organic foods thrive particularly, dissolve it and reduce both this, as likewise the other soluble matters, to simpler substances. In this tank little or no air is admitted. The resulting effluent then passes to a series of so-called "filters," to which I will return presently.

I leave the "cultivation tank" to describe very briefly what is called the "septic tank." The author of this is Mr. Cameron, the City Surveyor of Exeter, who also took up the biological treatment of sewage a few years ago. His experiments took a slightly different line. Whilst Dibdin and others passed the sewage into a tank filled with broken brick or coke, Cameron tried the effect of allowing the sewage to remain in a simple closed tank (containing no broken material) for some hours, and found as a result that the sewage was rapidly purified in a great measure. A tank was then erected of such dimensions, that the sewage of a portion of the town might constantly flow into it at one end and pass out at the other, the time occupied being about 24 hours. It was then found that in fact great changes took place in the sewage. By means of a "manhole" from which the interior of the tank could be observed, it was seen that the solid matter would first settle to the bottom, then rise with bubbles of gas to the surface, then fall again, and apparently this process goes on from one end of the tank to the other. A scum, consisting of organic matters, forms on the surface, which seems to be thicker in winter than in summer, but never requires removal, and an ash-like deposit collects very slowly on the bed of the tank, which consists largely of mineral matters. Gases are evolved in this tank consisting largely of mathane, with some carbon dioxide, and this is utilised to illuminate the works at night. The effluent from this septic tank is free from smell and is clear. Like the effluent from Dibdin's bacteria tank, it then passes to the biological filters.

These consists of simple vessels filled with broken material, such as coke, and here the effluent is allowed to remain for several hours, after which it passes out, and the filter is left empty for purposes of æration before being filled again.

By an ingenious device, due to Mr. Cameron, the flow of water from the septic tank, opens the tap of one, or closes that of another filter at the proper time, thus enabling the series to work automatically. The raw sewage runs directly into the septic tank continuously, and passes from it again similarly uninformly to the filters, which, as I have said, work automatically. The apparatus requires therefore a very small amount of supervision.

The effluent from the filters is not only free from odour, it is so pure that it remains perfectly clear and bright for any length of time in closed bottles, which is one of the severest tests of the purity of water, and it has been drunk by more than one person without any ill effects whatever. Thus putting the matter very briefly, one class of organisms inhabit the septic tank or "bacteria tank"; these thrive on complex organic food, and are largely anærobic in character. Then, secondly, the biological filters are inhabited by another class of organism, which are ærobic and feed on the more or less simplified material, converting it into still simpler matters. The chemical changes may be very briefly described as follows: the carbo-hydrates are reduced to carbon di-oxide and mathane, the albuminoids and amides first to ammonia and then largely to nitric acid.

And now you will doubtlessly agree with me that the value of the biological treatment of sewage is just as important to agriculture as it is to the sanitary authorities. Especially is this so here in India. Not satisfied with converting the farm manure into fuel, the attempts to utilise the city manure have been generally of just as ruinous a description. A dry-earth system, which if it could be perfectly carried out, could not readily be improved upon, has been converted into a general nuisance; the whole of the manure has been placed in a few square yards of land, to the utter ruin of our friend the microbe. Suggestions that the manure should be given in smaller doses over a large area have been met by the rejoinder that such was impracticable. Now, likewise in the case

of the biological treatment of sewage, we have a means of converting our city manure supply, without any nuisance at all, into a most valuable liquid manure, which may be run on the fields all round the town, and thus a material increase of plant food will be recovered from the hopeless wreckage which at present prevails. But this result will not be attained if we are ungenerous to our microscopical friend. He requires to be treated well, to have his home *i.e.*, the particular part of the septic tank or filter which he has colonised, left undisturbed, and, above all, if we are stingy with the allowance of water, he will be unable to serve us well.—*Indian Forester.*

THE CASSAVA-PLANT.

The Cassava is, *par excellence*, the nutritive plant of the African races and of the indigenous populations of the West Indian Islands, of Central America, and of equatorial South America. It will, therefore, be seen that it supports the life of a goodly part of the world's population. It is also very much made use of in Europe, and especially so in England, in the preparation of biscuits and of dietetic articles. Its principal product, *tapioca*, is known universally.

The prevailing opinion in France is that tapioca and, especially, the good quality of tapioca, is obtained only in Brazil. Now it is a fact that cassava is cultivated in all French colonies, and the makeing of tapioca is one of the rare manufacturing industries in the colonies, one of the most interesting of all colonial manufactures. Tapioca grown in the French colonies comes chiefly from the island of Reunion.

There is sold, besides, enormous quantities of tapioca into the preparation of which not an atom of cassava enters, but which consists simply of potato-starch. This is a falsification which the consumer may readily recognise. The grains of European tapioca are, in fact, more regularly rounded and whiter than those of genuine tapioca. Besides which, however well purified it may be, the spurious tapioca always keeps, more or less strongly, the characteristic odour of potato-starch.

The Cassava plant is a shrub with tuberous roots, which sensibly call to mind those of the dahlia. Two sorts are distinguished—sweet cassava and *bitter* cassava. The tubers of the latter—(*Manihot utilissima*)— the most useful, contain a poisonous principal (hydrocyanic acid) which makes their use dangerous in the raw state, but which in the preparation of starch is caused to disappear completely.

[Hydrocyanic acid being volatile, completely disappears on the application of heat, as in baking or boiling.]—*Translator.*

In preparing cassava the pulp of the tubers is rasped, and the material is soaked in water. The sediment which is formed at the bottom of the water, when collected and dried, is the cassava-starch of commerce. It is employed as a food-stuff, either as the *pulp* itself or as *starch*, properly so-called.

The grated pulp, washed and dried, is known under the name of cassava-flour or *farina* when it has been heated and pounded. Cassava-farine replaces bread in the food of the natives. In Guadeloupe, but more especially so in Brazil, it is seen every day, by habit, fancy or necessity, on the table alike of the poorest and of the richest of the inhabitants of the country.

When reduced into small lumps and only slightly heated, it is called *conague*, a native term. When simply grated and dried at the fire in the form of a pikelet or muffin [the *torta* or *bunelo*, of Spanish America] *Tr.*—it is called *cassava.* It is generally consumed under this form in French Guiana.

The starch dried in the open air is known as *cispa* or *moussache.* From this sweetened cakes are made, and other very agreeable dishes and pastry. When slightly damp and grilled upon plates of copper at the temperature of boiling water (100deg. Centigrade) it constitutes *tapioca.* The dregs and residues from the operations of preparation are made use of in producing alcohol.

The cultivation of cassava should be encouraged in our [French] colonies, for its product are sure to find a sufficient market in France. Besides its uses as a food, which are very numerous in form, and which we shall have frequently the opportunity to point out, cassava-starch can be employed in many manufactures:—paper-making, soap-making, in the making of glucose, or starch-sugar, and in making size and adhesive paste

Let us say, in concluding, that we shall be glad to see the employment of tapioca from Reunion, which yields nothing to any foreign tapioca, and also to see the use of cassava-farine more general amongst us, the reason why their use is not more common being entirely due to simple ignorance of the delicious pastry and the exquisite dishes which can be prepared from these two forms. We shall deal with this subject in future special articles.

Cassava-starch can be made use of in the preparation of all kinds of cakes, just as flour or the common starches. It gives them a particularly agreeable flavour, and greatly increases their hygienic and nutritive properties. One of the best preparations that has ever been made is wheat-cassava.

[Translated for the "Journal" from the French journal *Les Produits Coloniaux dans l' Alimentation*, March 31, 1901, by JAMES NEISH, M.D., Old Harbour.]

N.B.—The author of this interesting communication appears to be a little antiquated in the matter of botanical nomenclature. The name now universally applied by botanists is no longer *Manihot*, but *Janipha manihot*, and it applies equally to both varieties, the sweet sort and the bitter. The old name *utilissima*, applied to the bitter kind, was in respect of its greater *yield*, not greater *usefulness.* —J.N.

[The real Farine is not powdered. It is simply the grated pulp of Bitter Cassava, with the juice pressed out; the pulp being then spread on an iron pan, not hot enough to burn it and make it stick to the bottom of the pan, but with enough heat to dry it; and, as the mess is kept constantly stirred and turned over, it falls into various degrees of coarse and fine granules, like biscuits ground into a rough meal.]—ED.

CASSAVA.—Almost in every issue we endeavour to direct attention to Cassava and its preparations, more especially the dry meal we call here Farine. In the further article on "Cassava" published in this issue, translated from the French by Dr. Neish, it is shown that Cassava and its products are much used in French colonies not only in the West Indies, but also those in the Indian ocean. The Curator of the Botanical Station at Belize writes in the "Journal" for June, the Cassava is the chief food of the Carib Indians of British Honduras who are the hardiest, healthiest and strongest lot of people in the country. The Indians of Colombia who perform tremendous journeys among the mountains carrying immense weights, subsist largely on Cassava or Yucca as it is there called; so do the Indians of Guiana; while the Mendioca and Farinha (Cassava and Farine) are the chief support of the labouring people along the river Amazon, whose strength and endurance, on scanty portions of farinha and fish, and nothing else save pacovas or plantains have been the marvel of travellers in these regions. Yet withal, Cassava and its preparations are much neglected as food in Jamaica. Notwithstanding the precarious state of poverty much of our population is in at present (and the people

from British Honduras down to Paraguay who live largely on Cassava are not more so) through loss of sale of exportable products for which there is either no demand or only very low prices offered, they go on ignoring to a large extent this product, which every good authority places as one of the most valuable edibles available in warm climates. It is superior to cornmeal *for this climate* as it is less heating in its effect on working people, and less irritating to the digestive organs of children, and it is more digestible than either Cornmeal or wheat-flour bread, as may be easily proved on trial. Cornmeal is an imported product, baker's bread is to all intents also an imported product, and even if this were actually cheaper than Cassava products, which they are not, would not be preferable to a home product; if we were receiving plenty of money readily from our exports and our buying power was good, by all means should we purchase freely what we could afford. Our buying power is very low yet the people accustomed in better time to purchasing imported articles of diet, never at any time necessities, but always in the nature of luxuries, go on spending their little monies on morsels of expensive imported articles, and ignoring to a large extent the production of their own fields, or what may be readily produced at their own door. Even the native yam when scarce and high priced, as it is at present, will be bought by the small piece at five times its nutritive value compared to Sweet Cassava, as if it was absolutely indispensable. If, however, Cassava, Sweet and Bitter, had been planted freely, as we have insisted on, (and it is so easy to grow,) the Sweet Cassava could now replace the yam temporarily, Farine which can be stored and kept in bulk for a year, if necessary, could replace the Bornmeal, Cassava Meal and "Bammy," or Cassava Cakes, the flour bread, and Tapioca, the rice to some extent, the saving to the individual and to the island might have been very appreciable, if this could have been done at the present time. We have not forgotten the Cassava starch, largely used,—but still many towns folk use imported Corn Starch admittedly inferior for laundry purposes. We ought even to export Cassava Starch and over and over we have put very fine stuff on the London and New York markets, but the market price is not enough to make its manufacture here by *hand labour*, a paying industry. If in Florida, where for several years past there have been starch manufactories working, using principally Cassava for making Starch can pay with but six mouths to grow the Cassava in and much cultivation and fertilizing required to make any crop yield well at all, then here where it grows a'l the year round, with typical soils for its production without much cultivation and fertilizing, if we had proper machinery, surely starch making would be profitable. We need some manufacturing concerns to employ labour, female labour especially.—*Journal of the Jamaica Agricultural Society.*

ADDITIONAL NOTES ON CARDAMOM-FRUITS.

By R. C. COWLEY and J. P. CATFORD.

In a paper read before the Liverpool Chemists' Association (*C. & D.*, lviii., 472) the authors pointed out that combustion in a platinum dish of cadamom-seeds leads to inaccurate results owing to reduction of the phosphorus compounds into phosphides and they suggested the use of ammonium nitrate as an oxidising agent to complete the oxidation. Further experiments on different samples, however, have shown that combustion in a clay pipe, also then suggested, produces results which closely correspond with those obtained with the use of the oxidiser. Neither method is, however, by any means perfect. They have since examined Malabar, Mysore, and Mangalore cardamoms, which Messrs. Evans, Sons & Co. gave them, and some of the results are tabulated in the following:

Variety.	Malabar.	Mysore.	Mangalore.
Number of fruits in 10 gms.	80	55	45
Percentage proportion of Pericarp.	30	25	20
Percentage proportion of seed...	70 { dark 57, light 13 }	75	80
Percentage of ash from dark seed	5	3·3	2 9
Percentage of ash from light seed	8·5-9	4·5	—
Percentage of ash from pericarp.	13	7·1	7·6

Lime was found to predominate in pericarps of all varieties to such an extent than an admixture of 20 per cent. of pericarp with seed is readily distinguished by precipitating the lime as oxalate from the acetic-acid solution of the ash, two-thirds the ash of Malabar pericarps is soluble in acetic acid, bud of the seed-ash less than one-half is solnble and this portion is mainly composed of potassium salts. Manganese and iron are present in all varieties of pericarp and seed; but in Mysore cardamoms only comparatively small traces are shown when small qantities are examined, such as would be used for pharmacopœial testing. Cobalt was not found in any of the three varieties—a result which entirely differs from those obtained from previous experiments with the seeds. There was another point of difference—viz., that dark and light Malabar seed on fusion did not differ in yield of metallic oxides as was previously recorded.

The authors proceeded to say that a quantitative test for volatile oil would not be so complicated or tedious as many of the standardising processes commonly in use. Absolute accuracy is not essential—*e.g.*, 10 grams. of seed might be required to yield 0·3 to 0·4 c.c. of volatile oil. They concluded with these observations.

An ash determination of cardamom-seed in itself is of questionable value as an index of quality.

The mineral constituents are not constant even in individual varieties.

The large proportion of lime in the pericarp is characteristic of all varieties.

The ash-percentage of light-coloured seed is always higher than that of the dark, because of the imperfect development of the organic matter.

The high proportion of mineral substances in Malabar cardamoms is not a matter to be ignored, for they think the medicinal action of the drug does not depend entirely on the volatile oil.—*Chemist and Druggist.*

ORANGES.—The *Fruitgrower* of London says that "Jamaica oranges continue to arrive and sell freely. These fruits have excellent flavour and fair colour. If only a little deeper colour could be given them they would be very fine market fruit. Most of the supplies available have been dearer at from 15s to 16s per case. That was the condition of things in October. Since then it is reported that the market for Jamaica oranges has "gone smash." The total receipt of oranges in Britain for the last week of October was three times more than the corresponding week of last year; 8,000 cwt came from Spain, 5,506 boxes from Jaffa, and from the Mediterranean generally large shipments arrived in Britain."—*Journal of the Jamaica Agricultural Society.*

APROPOS OF CASTILLOA TUNU HEMSL. AND OF OTHER NEW CASTILLOAS.

(Appeared in the "Journal d' Agriculture Tropicale" of 31st August 1901).

[EDITOR'S NOTE.—We draw the special attention of our readers to the letter from Mr. Eugene Poisson, printed below. Mr. Poisson has been good enough to respond to the appeal we made, in our July number, to his zeal in the cause of science; we are most grateful to him for it.

With regard to the facts Mr. Poisson gives on the origin of his specimens of *Castilloa Tunu* HEMSL., details are so absolutelyprecise that no doubt whatever remains as to the difference existing between the bad *Castilloa* of KOSCHNY, called TUNU by the inhabitants of the valley of San Carlos, and the *Castilloa Tunu* HEMSL. of the San Jose country and of British Honduras, sold by Mr. GODEFROY-LEBEUF.

To discover what exactly the TUNU of KOSCHNY is, we must have a little patience; the Berlin botanists will perhaps tell us shortly.

The letter of Mr E. Poisson contains two other hints of great practical value; the first is as to the varieties of the *Hevea brasiliensis*. On this head the observation of our correspondent, made at Para, has just found confirmation in an analogous remark made on the cultivated *Hevea* by Mr. Derry in the Malay Peninsula; we will again refer to it in our September issue of the *Journal d' Agriculture Tropicale*. The second observation in Mr. Poisson's letter refers to the remarks of his father and of Mr. Jules Guerin upon a *Castilloa* giving a fishy extract, which is met with in Guatemala. Planters will be indebted to Messrs Guerin and Poisson for letting them know of this "LIGA," for which the place in botany has yet to be determined, and they will know they have to beware of this *Castilloa*.

Unfortunately, to be able to avoid a species, one must know it well, but a precise and useful description of a plant can only be given when it has been duly classed in the botanical hierarchy; and that is what is now being done at the Museum of Natural History in the matter of the LIGA. (Signed J. Vilhouchevitch.)]

Paris, 12th August, 1901.

Dear Sir,—In reply to the article "GOOD AND BAD CASTILLOA" contained in No. 1 of the *Journal d' Agriculture Tropicale*, in which you are kind enough to mention, may I offer you the following reflections;—The botanic and economic study of the genus *Castilloa* is far from being exhausted. This is as much the case for this genus of Artocarpacae as it is for the *Heveas*, of which the numerous species are not yet disentangled in any satisfactory manner, in spite of the ability and the ceaseless labours of MR. BOTTING HEMSLEY. This savant has set himself to elucidate the question of the *Heveas*, the *Castilloas*, and the *Sapiums*, the three principal American genera producing caoutchouc.

Many other sorts of plants are cited in the books as yielding a utilisable latex, but a great number have not been studied at close quarters; many calculations will be upset when well-conducted experiments have been made.

As to what bears upon the *Castilloa* of Costa Rica, which I know a little, I have not heard Mr. PITTIER DE FABREGA say that there are other species, and I myself have only seen one kind of tree, the *C. Tunu*. It is possible that elsewhere, on the Pacific slope for instance, there may be *Castilloa elastica* and perhaps other species besides, since MR. HEMSLEY has just published a new *Castilloa C. australis*, in *Hooker's Icon. Plantar* (February 1901) of the Peruvian region.

Of the *Tunu* I have brought back

(1) Branches bearing fruits taken by me from the trees themselves;

(2) Herbarium specimens, in Flower, given me by MR. PITTIER. These materials have been sent to the Museum of Natural History.

At my request, some fruit-bearing receptacles have been sent to MR. B. HEMSLEY, the learned curator of the Kew Herbarium, who I knew wished to complete his description before the publication of this Castilloa, which until then had only been remarked in British Honduras. A little time afterwards, my father inserted a note in the Bulletin du Museum 1900, (p. 137) on this new plant, and shewed, at one of the monthly reunions held in that establishment, a fine specimen of the caoutchouc furnished by it. After a testing carried out by Mr Lamy Torrilhon, this caoutchouc was valued as first quality. At the same time, my father soon regretted having misunderstood a page of the BULLETIN OF MISCELLANEOUS INFORMATION, of Kew (June 1898), which he would have cited, and in which Mr. Hemsley gave the history of the *C. Tunu* before his publication. Already Sir J. Hooker in (*Transac. Linn* bot. ser., 2, II, p. 212) had spoken of this *Castilloa*, which to him appeared distinct from the *C. elastica*; MR. ROWLAND CATER would have confirmed him in this idea, but there was a doubt on the point, and the uncertainty could not end until samples complete and in good condition could be had. Thus it has required long years for a full knowledge of this species. If I have dwelt on this point, it is in order to shew what perseverance is necessary to clear up questions of this kind; they are liable to remain indefinitely in obscurity without sustained efforts made. The geographical area of the *C. Tunu* is thus very extensive, relatively for it reaches from British Honduras to Costa-Rica; perhaps even going further yet to the south. We must not forget that in the identification of botanical species trouble often arises from the fact that popular names vary from one region to another; at times these local names are different in one and the same country. Thus, in Honduras, the *C. Tunu* has two or three distinct trivial names; in Costa Rica it is called ULE MACHADO in the district of San Jose, and perhaps something else on the western slope of that State.

As to what relates to the work of MR. KOSCHNY, I think it ought to be taken into consideration, but without going further until the sorts, varieties or species of which he speaks are clearly distinguished botanically. It is besides quite possible that there may be a correlation between the abundance or the quality of the latex of these different castilloas and the appreciable organographic characters of each of them. This fact would accord with what I have seen in Amazonia in certain races of *Hevea*, mentioned in the Report I am preparing for the Minister of Public Instruction. Another interesting observation on the *Castilloa*, which I have from my father, Mr. Jules Poisson, is as follows:—MR. JULES GUERIN, commisary-general for Guatemala at the Universal Exhibition of 1900, had brought herbarium specimens of two *Castilloas*, with samples of latex. One of them, recognised as being the *C. elastica*, gives a latex coagulable as is customary in that species. The second, called *C. Liga*, produces a milk which will not coagulate or gives a useless material. Nevertheless, the herbarium specimens are hardly distinguishable by the most experienced observer. The *Liga* has the leaves a little less silky, the tints a little less clear, but are these characters constant? One can understand how, in practice, mistakes are easy, since the collectors mix without noticing the two latices, whence irreparable damage to the gathered material when the labourers come upon the bad kind of *Castilloa*. The herbarium samples are unfortunately unaccompanied by flowers and fruits, which perhaps would decide the question. We must only wait until Mr.

J. Guerin, who directs the Central Chemical Laboratory at Guatemala, sends more complete materials so as to determine the point. It follows from these facts that it is prudent to maintain a reserve when treating of a subject such as the botanic determination of economic plants; otherwise one runs the risk of spreading errors and often even leading colonists into ruinous enterprises.

I am &c.

(Signed) EUG. POISSON.

CASTILLOA TUNU HEMSL.; DOES IT CONTAIN CAOUTCHOUC?

(Appeared in the "Journal d' Agriculture Tropicale" of 31st October, 1901.)

We have already given upon this question, in our July issue, a note entitled "Good and Bad Castilloa" extracted from a recent German monograph by Mr. Th. F. Koschny, also a reply by Mr. Godefroy Lebeuf; in our No. 2 (August), a Note by Mr. Eugene Poisson. Today we are in receipt, on the same subject, of an article by Mr. H. Pittier, and a letter from Mr. Th. F. Koschny which we will publish as soon as possible hereafter. We add to this an extract by Mr. Pearson, completing the indications of Mr. Koschny.

We are very fortunate to have elicited this series of communications.

It is impossible to draw any immediate conclusion from it, the contradiction of the two opinions being absolute, and one of the parties to the debate being absent; for Mr. Eugene Poisson has just resumed in Dahomey the sequel to his economic and agricultural exploration of last year, and from now to his return to Europe, we must not count upon him.

Be that as it may, it is already something to have fixed the point at issue; the "Journal d' Agriculture" can take this much credit to itself.

As for giving the final solution of the question set, that is not within our competence; it is not to be reached by any retrospective discussion; we must have new materials and fresh researches on the spot. For this reason we propose to close the discussion at this point, and not to go back again upon *Castilloa Tunu;* at least not until the botanists of the Botanic Garden at Berlin have pronounced upon the specimens of Mr. Koschny. As soon as their specific determination has been made, we shall hasten to let our readers know of it.

The best way to disentangle these vexed questions would be to send to America a professional botanist, whose mission would be to study on the living subject, in their several countries, the different species, forms and varieties of the genus *Castilloa.* He must have in view this sole object, and be in a position to devote a sufficiently long time to it.

If people were willing to assign to the botanical study of the Castilloa one-hundredth part of the money invested up to now, more or less blindly, in its culture, there would be the wherewithal to organise a very complete mission of research.

What we are asking to be done for the Castilloa is what the Germans are this moment doing for the Hevea; the initiative being due to Dr. K. Schumann, Conservator of the Botanic Museum at Berlin; the money having been furnished by Mr. Witt, a merchant at Manaos, and Dr. H. Traun, a manufacturer at Hamburg.

The botanist appointed in the first place by these gentlemen, Dr. Kuhla, having succumbed to yellow fever before he could enter upon his campaign, he was replaced by Dr. Ule, assistant-director of the Botanic Gardens of Rio de Janeiro. The *Notizblatt* of the Berlin Botanic Garden (issue for July) gives a first report from this savant; at the present moment it can be affirmed that the practical results, as regards the culture of the *Hevea,* will be most important.

The genus Castilloa deserves to be taken up a fresh on its own account in its own environment, both in the botanic and the economic sense; at the stage now reached, this work can only be carried out to advantage on the spot.

This is the only conclusion we would draw from the debate on the Castilloa Tunu.—THE EDITOR.

THE CASTILLOAS OF COSTA RICA.

(By Mr. H. Pittier; Director of the Physico-Geographic Institute of San Jose de Costa Rica.)

Under the title "Good and Bad Castilloas" the first number of the "Journal d' Agriculture Tropicale," publishes a short article which, we regret to say, will hardly contribute to clear up a question in itself quite entangled enough.

Castilloa plantations existing in Costa Rica.—There is no plantation of Castilloa in Costa Rica over twenty hectares in extent or three years of age. The only old experiment, dating some fifteen years back, has been a regular failure as such. The plantation referred to is "La Pepilla," in the plains of Santa Clara, a plantation exploited by me in 1899 on behalf of the United Fruit Co.; in spite of its age, it has never produced more than the absurd quantity of eight grammes of dry caoutchouc (burrucha) per tree (average of 1,500 trees fit for tapping.) Our friend Mr. Eugene Poisson visited "La Pepilla" along with us, and can confirm what we say of it. Moreover, the example of "La Pepilla" is not conclusive; the land chosen (about 20 hectares) was detestable for the most part, marshy in some places and too clayey in others. After some years the plantation was invaded by a grass forming a carpet, a very bad thing for the Castilloa; then later on they turned cattle loose to pasture on it, a much worse thing, for the trampling of the soil is fatal to trees whose roots are so superficial. In spite of this by no means encouraging experiment, other enterprises have been inaugurated during these latter years, one at Las Lomas, in the valley of Reventazon, another near Jimenez in the plains of Santa Clara, a third near Las Canas, on the Pacific slope. There are perhaps some others, but all are certainly recent and the total of conclusive experiments they can bring towards the solution of the problem of Castilloa culture is consequently very low.

A thoroughly trustworthy person, a landowner at San Carlos and familiar with that region, assures me that he does not know of any plantation or *Hule,* old or new, except a few recent attempts the extent of which does not exceed half a hectare. By what has preceded this, I do not at all mean to dispute the very real advantages the valley of San Carlos possesses for the cultivation of *Castilloa.* On this point I am quite in accord with Mr. Koschny, and I believe that in no part of Central America can the cultivation be undertaken with better prospects of success. Castilloa abounds there in its natural state, and developes in a manner truly marvellous, but as to all that concerns its cultivation, past experience remains *nil* or next to it.

The question of Species.—Turning to the question of species of Castilloa, as far as I know, the four following have been described up to now:—(1) *Castilloa elastica,* Cerv.—Found throughout Central America. It is undoubtedly the predominant species in Chiapas, Soconusco and a part of Guatemala. (2) Castilloa Costaricana, Liebmann.—Gathered for the first time at Turrialba Costa Rica, by Oersted. (3) *Castilloa Markhamiana,* Markham.—The species of the isthmus of Panama, or Darien, and probably of the whole area of dispersion of the genus throughout South America. May it not have been to this species that the *C. australis* cited by Mr. Godefroy Lebeuf belongs? A species cited without name of the author (p. 20 of the 1st No. of the *Journal d' Agriculture Tropicale.*) 4) *Castilloa*

Tunu Hemsl.--The *hule macho* (not *Machado*, as Mr. Poisson writes it), *or hule colorado* of the Costaricans. Macho means male. Tunu, and in some cases *tanu*, is the Mosquito name of this species.

This is not the place to discuss the value of the three first species, which are distinguished one from another by characters drawn from the carpels and other parts of the organs of fructification. We will say but one thing, and that is that *all the specimens of Hule gathered during the botanic explorations of the Physico-geographic Institute, directed by us in 1888, correspond with the description given* by *Liebmann of his Castilloa Costaricana.* This certainly does not exclude the presence in the country of the *Castilloa elastica*, Cerv, which besides cannot well differ specifically from the foregoing; if this last hypothesis is not confirmed, the presence in Costa Rica of the species of Cervantes remains yet to be proved. We will say the same of the *C. Markhamiana*, a species equally doubtful and to be studied anew.

Castilloa Tunu, Hemsley.—As for *Castilloa Tunu*, it is a species absolutely distinct from the foregoing, described recently by Mr. Hemsley, if we mistake not, from samples collected by us personally, in March 1898, in the valley of the Diquis, on the south-western slope of Costa Rica, and distributed by the Physico-geographio Institute under the No. 12,051. The original label, accompanying the examples from the National Herbarium of Costa Rica, says they come "from a tree abounding by groups in the region of Diquis, attaining a height of 8 to 12 metres, and distinct at first sight from other *Castilloas* by its coriaceous, glabrous, sharply entire leaves, and by its female receptacles being very small, and flanked by seeds of which the glabrous envelope shews from three to six sutures keeled." Among the specimens now before us, there is one bearing three cupules with seeds, answering to the description above, with a solitary male receptacle near the end of the branch; two other pieces of branch only present male flowers of which the receptacles seem mostly twin, as in the other species.

Lastly, we are in a position to state that Mr. EUGENE POISSON, to whom we have made a present of a part of the samples mentioned above, has taken away from here neither the milk nor the caoutchouc of the *Castilloa Tunu.* There has simply been a lamentable confusion of names and specimens. The milk carried away by Mr. EUGENE POISSON, drawn by us together, is that of the HULE proper *(C. Costaricana)*, at "LA PEPILLA"; the specimen of gum of which Mr. Godefroy Lebeuf speaks, was extracted from our own gatherings, and from the same species in the plains of Santa Clara. Some botanical specimens, of which Mr. Poisson has taken away a portion while the rest figures in our herbarium and has been distributed under the number 13,429, were gathered at the same time and place as the milk, and can in no way be confounded with the *Castilloa Tunu.*

The latter, which has not been reported with certainty until now on the Atlantic side of Costa Rica, gives, it is true, an abundant milk, but the rubber drawn from it gets brittle and falls to powder in a very short time. In the New York market it is said to have been quoted, a few years ago, at from 12 to 14 cents, a price so unprofitable that the exploitation of this species has been completely abandoned.

Opinion on the species noted by Mr. Koschny.—As for the new species or varieties of Mr. Koschny, I cannot make up my mind to give them a botanic value; the distinction through the colour of the bark, by which he is guided, is insufficient.

I am convinced that we have here to deal with no more than individual differences, the result of immediate environment and changing with its conditions.

(Signed) H. PITTIER.

[*Note by the Editor.* We must bear in mind that Mr. Koschny has taken care to send herbarium specimens to Berlin; the only thing to be done is to await quietly the decision of the botanists charged with their examination.]

APROPOS OF THE ARTICLE: "GOOD AND BAD CASTILLOA."

(A letter from Mr. Koschny.)

Mr. Koschny, who is one of the oldest colonists of San-Carlos in Costa-Rica, like all educated Germans, reads French, but is not well enough acquainted with it to write articles in that language; his letter is therefore written in German; we will summarise its contents.

USELESSNESS OF THE GUM OF THE TANU.—Mr. Koschny maintains that the latex of the Tanu only furnishes a hard gum, brittle and devoid of elasticity; he is convinced that his Tanu is really the *Castilloa Tunu*, HEMSLEY. Let us leave the professional botanists to settle this point after comparison of the herbarium specimens.

Mr. Koschny adheres to this pronunciation, contrary to Mr. Pittier, who writes "Tunu."

The Tanu, Mr. Koschny writes to us, is abundantly represented on the Mosquito Coast, but it exists also on the Pacific. The name is reserved expressly for the trees of which the gum is brittle. The reputation of this gum is so atrocious that the merchants of New York refuse the "Sheet Rubber" of Nicaragua in spite of its cleanness and careful preparation; and this is simply from fear of coming upon goods falsified by the latex of the Tanu. Indeed the preparation of the sheets makes this falsification possible, while it cannot be effected in the case of "scrap" (Castilloa caoutchouc coagulated spontaneously on the trunk itself or at the foot of the tree.)

Everyone in this country, says Mr. Koschny, knows the evil repute of Tanu gum; the French Consuls at Panama and Bluefields can, if necessary, certify to the fact.

We sincerely thank Mr. Koschny for having given himself the trouble to pick out what appeared to him inexact in our article of July. We hope he will do so again whenever he meets with, in the *Journal d' Agriculture Tropicale*, any question falling within his competence. We have no preconceived opinions whatever, and far from evading discussion we invite it, so long as it keeps inside the field of fact.

INDUSTRIAL USES OF TUNU ACCORDING TO MR. PEARSON.

What Mr. Koschny says of the stuff known in commerce under the name of Tunu, is quite in accordance with the information to be read in the volume "Crude Rubber and Compounding ingredients" of Mr. Pearson, Editor of the *India Rubber World*, the great New York caoutchouc review; here is the text in question:—

"Tuno, Toonu or Tunu, is a name of uncertain origin, applied in commerce to designate a caoutchouc gathered chiefly in Nicaragua and Honduras. . . . Its coagulation is effected by heat. The rubber obtained has but little elasticity; it becomes very fishy when heated; its selling price is low. It is used in the making of pencil erasers, and, mixed with balata, in the manufacture of driving belts.

"Sometimes this rubber is sold under the name of "Seiba Gum," after it has been made to lose its natural appearance by a laborious soaking under water. The true caoutchouc of Nicaragua is sometimes adulterated by the addition of Tunu, just at the moment of coagulation; this mixture makes the rubber lose in a short time its suppleness and its industrial qualities."

THE FERMENT OF THE TEA LEAF, AND ITS RELATION TO QUALITY IN TEA.

BY HAROLD H. MANN, B. Sc.,

SCIENTIFIC OFFICER TO THE INDIAN TEA ASSOCIATION.

From the commencement of the mannfactnre of Black Tea in India the natnre of the process of fermentation, which plays snch an important and essential part in the mannfacture of tea, has been a subject of controversy. In the years before 1880 for instance, a most energetic discussion took place.* On the one hand it was contended, and with good show of reason, that the process was merely one of incipient putrefaction. On the other, with eqnal vigour and with equal reasonableness, that the resnlt obtained was entirely independent of any tendency to rot and, though it might run parallel with it, was an entirely independent process. Inasmuch as all these views were based entirely on speculation, and were put forth without an attempt even at a microscopic examination of fermenting leaf, they naturally led to no better understanding of the question.

MR. BAMBER'S EXPERIMENTS.

The investigations of Mr. Bamber were, in fact the first of any importance on the subject, and he has remained practically ever since the standard, if not the only, authority on the subject. His investigations, which it is well to recall, led him to make certain experiments, the following account of which I quote from his "Chemistry and Agricultnre of Tea."†

"The following experiments were made in Assam to determine whether the changes, which take place during the process, were due to the presence of either an organised or soluble ferment or merely to oxidation:—

1st.—Freshly rolled leaf was placed under a receiver, and the air exhansted as completely as possible. Little or no change took place, and the leaf at the end of 24 hours was still a dull green colour, with a little brown colour on the stems. Admission of air or oxygen at this period had no effect on the colonr, probably owing to the comparatively dry condition of the leaf.

2nd.—In this experiment the air was exhausted as before, and pure dry oxygen gas admitted; in half an hour the leaf had attained a bright coppery colour, and in two hours the whole of the leaf was a uniform dark red, and had gone beyond the stage required for ordinary mannfacture. Duplicate experiments were made of the above with similar results, and in each case a sample of the same leaf was treated in the usnal manner for comparison with the experimental leaf, the flavour of the teas treated with oxygen gas did not differ from the ordinary teas, but the infusion had a brighter appearance.

3rd.—The rolled leaf was treated in vacuo with pnre carbonic acid, which is an inert gas, with the resnlt that at the end of 5½ honrs it was still a dirty green colour, while a sample treated in the nsnal manner attained the required colonr and condition in 3 hours.

4th.—The leaf was exposed to a limited snpply of air and even after 20 hours was still of a greenish colour, and the tea mannfactured from it was very pungent, showing that little of the astringent properties had been destroyed.

5th.—The rolled leaf was treated with dry steam at a high temperatnre for a few minutes, and was then treated as usnal, when it attained a good bright colonr.

6th.—The rolled leaf was treated with air and oxygen gas, which gave a bright colour; the liquor was flavoury, but not very pungent, and infusion bright.

"All the above experiments tend to show that the change in the leaf in the so-called 'fermentation, is due to oxidation. Microscopic examination has failed to show any organism; and the fact that the change will take place in an hour or less from the breaking of the cells is, I think, conclusive evidence that it cannot be dne to the development of living organisms."

These experiments, thus reported, formed an enormous advance on the preceding condition of ignorance on the question. But yet on careful examination it will be seen that Mr. Bamber's conclusions were not quite justified by experiments. In one case he has since* withdrawn from the position he then took up, and has himself announced the discovery of an oxidase or soluble ferment to which he now ascribes the changes occuring dnring fermentation. He announced this last discovery in the following words:—

"Quite recently I have succeeded after numerons attempts in isolating a minute proportion of a soluble oxidising ferment, somewhat similar to the oxidases recently discovered in several plants of different natnral orders. The substance in question, which evidently has a considerable bearing on the oxidising properties of the tea, apparently does not exist in the active form in the fresh green leaf, but is changed either during the withering, if the leaf is bruised, or during the rolling processes when the various organic acids, etc., are liberated from the cells.

The discovery here made has been confirmed by one or two independent observers since the time.†

In another point Mr. Bamber was also in error in the views expressed in 1893. He states that he found no living bacteria or other organisms on the fermenting leaf, but I have never been able to find tea during this process on which a comparatively large number of organisms could not be found. Whether they have any part in the process is another question, but they are in evidence on every sample which I have examined.

FERMENTATION AT A HIGH TEMPERATURE.

But assuming that the conclusions are in general correct, certain results would natnrally follow. It would seem likely that a high temperature would be the best and quickest for fermentation, since oxygen is then most active and the action of stray microbes would be entirely eliminated above a temperatnre of 110° F. It therefore seemed advisable to try whether fermentation would proceed normally and correctly if the mass were raised above that temperature. Two samples of rolled tea leaf were therefore taken, one fermented at ordinary temperature (73°-74° F.), and the other, with due precautions that no drying of the leaf took place, at 120° F. As a matter of fact to all appearance, both coloured normally, that at the higher temperature a little more rapidly. When apparently ready both samples were fired in the same way, and the tea examined. In the result it was found that the hot fermentation gave a slightly lighter, but a little duller liquor. It had a tendency, though not a very marked one in the present case, to be soft to the taste.

So far, however, the result is in conformity with the idea that bacterial action could have nothing to do with the operation, seeing that no organisms could be active at the temperature employed, and yet a fermentation, not quite normal, certainly, but nearly so, could be carried out.

OXIDATION BY CHEMICALS.

It might, however (still on the basis of the above assumption that oxidation by contact with oxygen gas is all that takes place), be possible to assist the action by some substance energetic in giving

* See Tea Cyclopædia, p. 211.

† Calcutta 1893.

* Report on Ceylon Tea Soils, Colombo, 1900.

† See Also Bull. Roy. Agricultural College, Tokio, 1901, &c.

oxygen to any body with which it was mixed. Two such substances, both of which could not damage the tea were therefore tried. These were Hydrogen Peroxide and Permanganate of Potash, either of which could be bought, were a demand to arise, at a comparatively cheap rate.

With Hydrogen Peroxide 4 oz. of a "one volume" solution was added to 2 lb. of leaf just from the roller, and fermentation allowed to proceed. After 45 minutes the lot of leaf treated was distinctly brighter in colour. The fermentation was considered complete in each case after 1½ hours, and both were dried in the same manner. I sent the teas to an expert taster who was good enough to make the following report:—"I give preference to 'B' (without Hydrogen Peroxide) samples which have much better appearance than 'A' (with Hydrogen Peroxide) and have more body. On the other hand 'A' samples have fine Darjeeling flavour, and almost perfect infusions. They only want a little more body in the cup, and less greyness in the dry leaf to make them very desirable teas." Eliminating all reference to the appearance of the dry leaf, it appears that the addition of an oxidising agent had little effect on the quality. A repetition of the experiment gave the same result."

In similar manner Permanganate of potash was added to another lot of rolled leaf (4 oz. of 1 per cent. solution to 3 lb. of leaf) and on drying after being fermented for the same time no difference could be detected in color of liquor, taste, or pungency.

The mere addition of Oxygen in an active form was therefore not capable of making the fermentation go either perceptibly more quickly, or more evenly. This would afford, were it needed, strong evidence against any theory of mere oxidation as explanatory of the changes which undoubtedly take place.

BACTERIA IN TEA FERMENTATION.

Though the first experiment above described appeared to have eliminated the possibility of bacteria being the cause of the changes, another effort was made to isolate such as were present, and likely to be of any importance, so that one might then ascertain whether they had any influence on the fermentation of rolled tea leaf. This was done by grinding up some fresh tea leaf to a pulp, then sterilising it by means of steam, and finally introducing into it a piece of fermenting tea leaf. After two days it was evident that growth of some organism was taking place, and on examination this was found to be a small rod-shaped microbe. I only succeeded in isolating this one type of organism from all the cultures that I made, but it was nevertheless invariably present. After a second culture in tea juice, freshly rolled tea was inoculated with this microbe, and allowed to ferment. After 1½ hours the tea was sour, while a check lot of rolled leaf to which nothing had been added was fermenting normally. This, I think, therefore, finally sets at rest the question as to whether actual living organisms play a part in the ordinary fermentation of tea. Though they are present always, they are present as impurities, and have nothing to do with the action which it is desired should go on, and they should be eliminated, so far as is possible, from the fermenting leaf, and the fermenting house.

FERMENT OF THE TEA LEAF.

But nevertheless there must be some active cause in the tea leaf which causes the production of the desired colour and flavour, especially as we have shown that oxygen alone is not capable of producing the effect, And this cause is the presence of a representative of a class of ferments—not actually living but always produced by living cells,—the discovery of which in tea was, for the first time, as stated above, made by Mr. Bamber in the early part of 1900. These "unorganised ferments" or "enzymes" as they are termed have been discovered in recent years to play a most important part in many operations where their presence previously had been hardly suspected. Taking the "oxidases," for instance, the class of enzymes which is active in the case of tea, it has been shown that ferments of a similar type also take a principal part in the production of Japanese lacquer,* and further, as has been still more recently discovered, in the curing and fermentation of tobacco.†

(*To be concluded.*)

THE RUBBER PLANTING SITUATION IN MEXICO.

(*To the Editor of the India Rubber World.*)

Regarding rubber culture in the Soconusco district, state of Chiapas, Mexico, I desire to say in the first place, that on the low lands of said county, and down near the Pacific coast, the rubber tree grows wild in profusion and in many instances is found of enormous sizes. On the "San Carlos" tract, for example, belonging to Mr. Alejandro Cordova, of Tuxtla-Chico, Soconusco, there are rubber trees which cannot be less than fifty years old, having a diameter of seven feet, and the space shaded by the foliage a diameter of at least seventy to seventy-five feet. Similar trees can be seen at the "Jesus Maria" tract belonging to Mr. Richard Bado, of Tapachula; on the different properties of Mr. Porfirio Aparicio, Tuxtla-Chico, towards the Guatemala frontier; and on "Los Cerros" and "Santa Isabel" tracts belonging to the Escobar family, also of Tapachula.

Now, as to the cultivation of the rubber tree in the same district, enough has been written lately to demonstrate that its returns provide plenty of margin for contingencies. I hereby give you some data in reference to this industry, the truth of which can be also easily verified.

In 1871 Romolo. Palacios planted over 100,000 rubber trees in connection with cacao on the tracts "San Antonio" and "Pumpuapa" of his property, about five miles distant from Tapachula, and near the seaport of San Benito, in the district of Soconusco. These trees have been gradually reduced in number by reason of forest fires until probably only about 6000 remain, The owner of the property, dying about ten years ago, left it to his son Teofilo Palacios, who now manages the estate. The rubber trees are tapped every year, and some of the product has been shipped at various times to New York, to Marquardt & Co., and W. Loaiza & Co., * and to London. I have never seen the trees tapped, but from what I have seen in the district I should say that trees of the age mentioned should yield readily at a single tapping 10 pounds of milk, which will afford 4 pounds of dry rubber per tree.

In 1872 the late General Sebastian Escobar, a well-known agriculturist, thoroughly acquainted with the nature of the Soconusco lands, and enthusiastic in the matter of agricultural progress, planted over 1,000,000 rubber trees on his properties called "Los Cerros" and "Santa Isabel." These trees were also planted in connection with cocoa, at a time when the Mexican government was seeking to encourage

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* Bertrand, 1894 and 1895.

† Oscar Loew. Bulletins of the United States Department of Agriculture, 1899-1901.

* It seems proper to state here that Messrs. Marquardt & Co. and also Messrs. Loaiza & Co. advise THE INDIA RUBBER WORLD that no rubber which they may have received from Mexico at any time has been described to them as being the product of planted trees.—THE EDITOR.

the planting of rubber by the payment of a premium or bonus. It was also at the time that an interest in rubber planting was being stimulated by Mr. Matias Romero. This plantation has also been frequently ravaged by fires, particularly such as result from the annual burning of the old grass to make the new growth more available for the cattle. Grazing, by the way, is the chief interest on this estate, and little attention really has been given to rubber. There are now perhaps 75,000 of the original trees standing, and from these more or less rubber is taken every year which reaches the agents of the Escobar estate. A greater amount, however, is probably stolen by neighbouring Indians. The rubber from this estate is sold in the Tapachula market, lots having been taken at different times by William Henkel & Co. for shipment to Hamburg, O. H. Harrison for London, and Louis Tomelen & Co. and others for Hamburg and New York. The "Santa Isabel" property is about 6½ miles from Tapachula, and the "Los Cerros" property thirty-six miles distant, near Guatemala.

In 1873 the late Mexican ambassador to the United States, Mr. Matias Romero, started, on the "Suchiate" tract of his property a plantation of over 100,000 rubber trees, and, as for political reasons he was compelled to abandon the property, when the trees planted grew large enough to yield rubber, they were tapped by the natives and nearly destroyed, but still there are many of them growing and yielding rubber to show what a cultivated tree will produce. This tract consists of 14,868 acres, about three miles from the port of Ocos beyond the Guatemalan border, and sixty miles from Tapachula. It is owned by the wife and sons of Mr. Romero, whose agent is Ricardo de M. Campos, collector of customs at Tapachula. Perhaps 2,000 or 3,000 pounds of rubber are sold each year through Heury Pincon, of Tapacihula, who represents some English firm in handlong the cedar wood which is the principal article of export from the estate.

In 1888, Mr. Rafael Ortega planted at "Los Cerritos" over 50,000 rubber trees which can be seen while going by the country from Sam Benito to Tapachula. This is a sugar cane estate, devoted to the making of rum for consumption within the country. The trees were planted in the open, bordering on both sides of the road, and probably 40,000 are still standing. Naturally all of the original planting would not survive, besides which some of the trees have been injured by the crowding of wagons when forced out of the regular roadbed by its bad condition in the muddy season. Mr. Ortega was a large coffee planter on another estate owned by him, and, getting into financial difficulties, was obliged to surrender all his properties, including that on which these rubber trees stand, to a German house, on account of advances made to him, and who are represented at Tapachula by the import and export firm of Louis Tomelen & Co. The rubber gathered from these trees is shipped to the various connections of the house of Tomelen.

In 1898, Mr. Ferdinand Nehlsen started in planting rubber trees on the "Ulapa" tract of his property, where there are many wild rubber trees. He has to-day over 1,000 plants handsomely growing. Teese trees were planted in the open in the grass lands, such as are maintained for grazing, which is the principal interest on this estate. The estate is near the Indian town of Excuintla, about 28 leagues from Tapachula.

In 1899, La Zacualpa Rubber Plantation Co. planted over 30,000 rubber trees, to duly appreciate the development of which they must be seen personally. This company is already tapping cultivated trees, which were planted by tho former owner of said "Zacualpa" tract, to shade his cocoa plantation, some twelve years ago, and during the last year has planted over 500,000 young rubber trees.

The Soconusco Rubber Plantation Co., organized by me and incorporated under the laws of California, October 16, 1900, owns 17,858 acres, with over 5,000 wild rubber trees yielding gum, and intends to transplant from its nurseries this year as many young trees as possible to enhance its production.

What precedes is sufficient in my opinion to demonstrate incontestibly the possibilities of rubber culure in the Soconusco district, and persons who are interested in this important source of wealth, if considering the matter seriously, will find out that the industry has long since passed the experimental stage in Soconusco, and today there are many companies and individuals gathering and shipping rubber from wild and cultivated trees, or selling it in the Tapachula market.

The time required to produce gum from the *Castilloa elastica* rubber tree depends upon the locality, rainfall, and methods used for its cultivation. My estimates of production and tapping age are based upon my personal experience and close observation, and not upon what others have written. The cultivated rubber tree blossoms after the sixth year, and cannot be tapped before this time without injury. The rainfall of the previous year generally determines the earliness of the season, the number of the blooms, the quality of the seeds, and the flow and quality of the milk itself.

The sap furnished by a seven year old rubber tree should yield a mimimum of 1½ pounds of pure rubber, and as every tree increases its yield by no less than half a pound of gum annually until its twenty-fifth year of age, at least from 15 to 20 pounds of pure gum should be obtained yearly there after during the life of the tree. So an acre of land containing 220 rubber-trees planted 14 feet apart each way, will give at the end the sixth year—or to be more exact, in the first crop made during its seventh year of existence—330 pounds of pure rubber, which at the rate of 50 cents gold, would give a revenue of $165. If this estimate of 1½ pounds per tree should not seem conservative enough, let it be one pound to the tree, and the return per acre will be $110.

The hardiness of the *Castilloa elastica* tree simplifies its culture very much, and as it possesses a vitality superior to that of the weeds or of any other kind of vegetation, it does not require heavy expenses for frequent weedings. If without any help from man such trees can grow for hundreds of years in wild woods full of vines, briars, and many other plants, under cultivation, they can certainly outlive the weeds.

I shall be very glad if the data contained in this letter contributes to its object, which is to increase among agriculturists and business men of enterpries the desire to plant on a large scale fields of rubber-trees in the localities suitable for that purpose.

CHAS. G. CANO, C. E.

New York, June 21, 1901.

[The writer of the above letter has spent nearly ten years in the district to which the letter relates. He went there first, at the request of President Diaz, to reform the customs service at Tapachula. He next became manager of the large coffee plantation "Guatima," of L. R. Brewer, in Soconusco. He was later employed as civil engineer on the line of the Occidental railroad, in Guatemala, after which he became engaged in the importation of Gutemala coffee at San Francisco. He has thus had ample opportunity to study the resources of southern Mexico, and has taken special pains to become acquainted with the prospects for rubber cultivation,—THE EDITOR.]

PROGRESS IN NICARAGUA.

A letter from James S. Nodine, manager of the Manhattan Rubber Plantation, at Bluefields, to the *India Rubber World*, states that on the day of writing—June 24—he gathered seeds from cultivated

Castilloa elastica rubber plants two years old. The plantation, he reports, is showing the most satisfaotory progress, leaving no room for doubt as to ultimate success. There are, altogether, about eighteen rubber plantations at Bluefields. Mr. Nodine writes that this year two of the planters in the district will tap their rubber for the first time. On the Manhattan plantation last year some Parà rubber seeds were planted, a large precentage of which germinated, and the plants are now growing well. Mr. Nodine has shipped rubber seed from wild trees this year to planters in Mexico.

RUBBER PLANTING IN THE MALAY STATES.

We think that this is a great rubber-growing country, and that if prices only hoid there is a lot of money in it. Labor aud suitable land are cheap and plentiful, and we have no fault to find with the yield either of *Hevea Brasiliensis* (Paraà) or *Ficus elastica*, locally known as "Gutta rambong." A certain amount of *Castilloa elastica* has been introduced, but it does not promise well, though apparently yielding large quantities of Caoutchouc, because, having a pithy and very brittle trunk, it is peculiarly liable to the attacks of the worst of our termites *(Termes gestroi)*—a white ant—which thrives on such food, and, commencing from below the ground, eats up through the centre of the tree. Borers, too, attack and destroy the branches. *Kickxia Africana* has been introduced in small quantities, but it is impossible to predict the success or failure of this rubber, as our biggest trees are scarcely more than seedlings yet.

For Parà rubber and *Ficus elastica*, however, there seems to be a great future, and any of your friends who are interested in the subject, and who would like to see what we are doing, might do worse than try a run over, with a note from you. I would gladly show them round and put them in the way of seeing all we have to show, and possibly they might think this small corner of the earth, not so bad after all. Rich in minerals, gold, and tin, with a great agricultural future before it, the Malay peninsula will hold its own with many countries better known at present. All we want is money and confidence, and the country will boom like wildfire.

Coffee has gone down with such a rush that many of us have lost pretty well all we have put in it, but we calculate in another three years to be on our legs again with rubber, and fancy that the rise in the sterling value of the *milreis* will knock agriculture pretty hard in the Brazils, while our coinage practically follows bar silver values.—A PLANTER. *India Rubber World.*

RHODESIAN REPORTS.

We have received from the British South Africa Company, *Reports on the Administration of Rhodesia*, 1898—1900. It may well be imagined that the effects of the South American war have not yet been fully felt or realised in Rhodesia; still, it is pleasant to hear that, so far, "the principal result of the year which has seen so much disturbance and trouble in South Africa has been to confirm and strengthen the belief of the settlers, and also of the board of directors and the shareholders, in the reality of the resources of the country, . . . In agriculture cultivation is extending, and live-stock is increasing. . . . In Mashonaland many farms are being occupied and worked by Europeans. Locusts disappeared almost entirely in the season of 1898-99, and this happy result is, no doubt, largely attributable to the use of antitoxine. The contentment of the native mind is largely dependent on the excellence of the crops, and in this respect the season of 1900 has been a satisfactory one. From reports received, I [Sir A. Lawley] estimate that the native crops this year have been more abundant than in any year since the occupation of the country. As railway facilities increase for the conveyance of farm produce to the various markets, the development of the agricultural industry in this country should be ever increasing. Both at Salisbury and Bulawayo most successful agricultural shows were held in May, and in point of quality and quantity the exhibits were remarkably good. Throughout Rhodesia fruit-trees have been imported in great numbers, and many thousands of various kinds have been planted. Perhaps the most interesting experiments that are now being made are in the growing of Coffee in Umtali, and of Rubber in the Melsetter districts. Coffee seeds were imported by the Government from Nyasa; they have germinated well, and the young trees are thriving. Mr. Renwick, of Melsetter, furnishes an interesting report on the possibility of developing a Rubber industry in that country. At present the prospect of successfully establishing such an industry is a matter for conjecture; but there is every reason to hope that Southern Melsetter, from the nature of its soil and its climatic conditions, is a country where this valuable industry may be introduced and conducted on a large scale with every prospect of success." The above sentences are mostly taken from the Report of the Administrator of Matabeleland, Captain the Hon. Sir Arthur Lawley, K.C.M.G. (resigned), and the sentiments expressed in them are borne out by the reports from North-eastern and from North-western Rhodesia, though over so large an area details naturally vary in the different districts. It should be mentioned that the British South Africa Company is now directly responsible for the administration of the following territories:—1, Southern Rhodesia, or the provinces of Mashonaland and Matabeleland; and, 2, Northern Rhodesia, or the whole of the British sphere lying between the portuguese Settlements, German East Africa, and the Congo Free State, with the exception of the strip of territory forming the British Central Africa Protectorate. It [Northern Rhodesia] is divided into two provinces—North-eastern Rhodesia, and North-western Rhodesia. The total population of Southern Rhodesia is estimated at 13,365 Europeans, and 449,901 natives. From the brief notes here extracted, some notion may be gathered of the importance of the book before us which deals with the state and prospects, political and industrial, of our African territories. The reporters seem, on the whole, sanguine that the country is one rich in resources, and with inhabitant, well qualified to appreciate and to develop them.—*Gardeners' Chronicle*, Oct. 5.

INSECT ATTACKS ON TERMINALIA CHEBULA.

The myrobalans of *Terminalia chebula*, commonly called *harra*, being one of the most important minor forest products of this Division, this tree received considerable attention; and the time of its flowering and fruiting and the development of its frui are duly noted. Last season the harra cro was practically a total failure, and this was cause by (1) the depredations of a defoliating caterpillar and by (2) the attacks of a gall insect.

In July, 1900, harra, together with several other trees including teak, *Anogeissus latifolia*, *Adina cordifolia* and *Stephegyne parvifolia*, were absolutely defoliated. I was unfortunately unable to leave headquarters at the time, and I did not succeed in getting specimens of the attacking larvæ from the harra trees themselves. Simultaneously with this defoliation in the district, however, an equally severe attack was made on the various garden and avenue trees in Jubbulpore itself. Larvæ clustered on the trees in enormous numbers and teak, *Millingtonia hortensis* and *Albizzia Lebbek* were, among others, completely defoliated. I collected several of these larvæ and the moth which emerged from them proved to be *Hyblæa puera.* At the same time as this occurred, the forests in the neighbouring district of Damoh were also attacked by a defoliating caterpillar, and specimens of the insect collected by the

Divisional Officer were subsequently also identified as *Hyblœa puera*. I am therefore inclined to think that this insect is also the culprit in the oase of the damage done to harra.

In consequence of this wholesale destruction of foliage, the teak and harra trees were practically devoid of flower and fruit, and the majority of the harra flower which was produced never developed on account of the attacks of a gall insect. In September, 1900, I noticed that the flowering spikes of many harra trees were covered with round bodies of a dark-red colour, bearing a superficial resemblance to the fruit of a species of small fig. It appears that the flowers instead of developing into the usual myrobalans had, owing to the attack of a cynipid insect, merely produced these small galls.

Specimens of the galls were sent by me to the Indian Museum for identification in October, 1900.

The insects which emerged from the galls were pronounced to be chalcids, and were forwarded by the Museum authorities to Mons. Andre, France, for identification. Mons. Andre, however, has been unable to do more than identify the insects as chalcids, and he surmises that they are parasitic on the cynipids which produce the galls. If this surmise is correct, and nothing but chalcids emerged from the considerable number of galls sent by me, it appears that the gall insect is subject to very widespread parasitic attacks in face of which it can scarcely develop to any extent or do any considerable damage. There appears, however, to be a possibility that the chalcids themselves are primarily responsible for the formation of the galls, and it is hoped that further observations and the collection of additional specimens will settle this point which is of considerable importance in harra-producing tracts.—*Indian Forester*

R. S. HOLE.
Divisional Forest Officer,

JUBBULPORE: 18th *April*, 1901.

MINERALS IN KUMAON AND GARHWAL.

Many parts of the Himalayas are rich in minerals, but there is hardly a portion of the world which has been less prospected than these mountains. While such out of the way places as Ashantee, the interior of Central America, and even Borneo and Sumatra, have been well examined by prospectors and command lakhs of British capital, the fine range of the Himalayas, which has railways to its foot-hills at many points, has hardly been examined in the least by the Geological Survey of India, much less by professional mining engineers. It is astonishing that so little has been done. Here is an immense range of mountains stretching from Afghanistan and Kashmir through Nepal to Burma, the geological structure of portions of which is not even known. The mountains consist of a great central range of granites and gneisses and crystalline rocks, with nearly 50 miles of lower hills on either side stretching into India and Thibet. Most of this vast range of country consists of formations more or less favourable for minerals. It is about the finest scenery in the world and the climate is excellent, hot for a month of two in summer but always cool at nights and cold in winter. Food is cheap and abundant, and the labour is docile, easily trained and cheap. The writer, who has for eighteen months or more been engaged in mining and prospecting in various parts of Kumaon and Garhwal, has rarely seen a country in which the indications are more promising. As far as can be seen these two provinces are full of minerals. Gold exists in the sands of almost every river, washed down from the reefs in the higher and central ranges. There are alluvial flats in some of the valleys, consisting of sands and gravels, which readily show a good colour in the pan. Some of these gold-bearing rivers take their rise in mountians not more than three days' journey from the plains. Quartz reefs occur in schistose rocks in many places, and some of these are known to be auriferous graphite of excellent quality, more easily mined than in Southern India, and asbestos, good in colour and long in fibre, is frequently found. Prophyritic granite, associated with much schorl is found in parts of Eastern Kumaon, and here true lodes have been observed traversing both the granite and the adjacent clay-state, and containing traces of oxide of tin. Sapphires and other precious stones are sometimes brought down by the Bhotian traders, who frequently come through the passes, driving flocks of sheep laden with borax and salt. Copper and lead have been abundantly worked in the past, and copper-bearing rocks are found all over both Kumaon and Garhwal.

At half-a-dozen places there are most extensive old works covering many acres of hill-side, and there are also mountains which here and there are literally covered with ancient slags, which have been assayed and are sometimes found to contain as much as 2 per cent of copper.

The revenue derived as royalties from the copper ores was pretty considerable, even in the first half of the last century. There is every indication that the copper ores mined before the country was taken over by the British must have been enormous, judging from the extent of old mines. The copper ores occur mostly in limestone formations, often associated with talo slates and sclists. Both irregular deposits and true lode formations are met with, some of the lodes being of great size. The ores mined long ago by the natives were mostly green and blue carbonates and the oxides of copper. Sulphides and sulphurets they usually put aside as being too refractory for their primitive methods of smelting, and beneath the deposits of carbonates which they worked out many extensive deposits of copper pyrites and grey copper are still left. In several cases known to the writer, lodes of copper and iron pyrites of considerable width crop out very close to the surface, which have been absolutely unrouched by the natives. One feature is the number of gossan "backs" to be noticed in the copper districts. The natives have occasionally worked these, presumably for iron, to a little depth, but there can be little doubt that systematic exploration would reveal in depth great masses of copper pyrites. The hill copper was formerly noted for its purity, and even now the natives prefer to obtain their metal from Nepal, owing to its being so much softer and purer than that obtainable from Europe. Assays of copper and lead ores from Kumaon and Garhwal show the presence of a considerable amount of silver, and occasionally a gold value is obtained.

The climate of Kumaon and Garhwal is excellent. All the hills which range from 6,000 feet upwards are clothed with forests of good-sized pine oak, and rhododendron. There are deep valleys between, often only 1,500 feet above the sea-level, in which oranges, lemons, peaches, bananas and other fruit flourish exceedingly. The land is so fertile that two crops of corn are reaped every year. The great difficulty is transport, all loads being carried up into the hills by coolies. Good roads can easily be constructed up the main valleys, and ample water power and facilities for wire rope railways occur everywhere. It is a matter of surprise that this vast country, so fertile and teeming with mineral wealth, has remained so long unexploited. If only the attention of capitalists were called to the possibilities of the Himalayas it would undoubtedly be explored, and found to be as rich a mountain range as the Rocky Mountains or the Andes.

Nearly the whole of the southern portion of the Himalayas is British territory, and there should be few, if any, difficulties in the way of prospecting these magnificent heights. F.G.S., A.I.M.M.—*Pioneer*.

UVA DISTRICT REVISITED.

AFTER AN INTERVAL OF TWENTY YEARS.

(*By an old Planting Correspondent.*)

There is a pleasant and a very unpleasant way of travelling through some of the tea districts of the Central Province, especially when twenty miles or more must be traversed on a dark night and there is no resthouse or shelter. Any "*stranger*" who wants to go to Nuwara Eliya *via* Gampola and Pussellawa should be armed with a letter of introduction or he will most certainly come to grief, there being now

NO RESTHOUSE IN PUSSELLAWA.

If we had known this and that, after travelling ten miles to Pussellawa, we should be obliged to push on another ten miles to Ramboda when very tired and hungry and the little bullocks of the hackery completely played out, we should most certainly have let Pussellawa slide and quietly stepped into the upcountry train at Gampola station for Nanuoya, and so avoided making a miscalculation and spending a miserable night on the road and going to bed without any dinner. Under such circumstances it is not to be expected that a very cheerful account of

PUSSELLAWA DISTRICT

can be written. The Gampola resthouse (or rather hotel) appoo tried very hard to get two coolies to carry baggage and, after a long search round the town, brought two men who asked for *one rupee and fifty cents* each, very reasonable certainly, but they did not get it all the same. Then a hackery was sent for and the bullocks were a failure; we made very slow progress even where the road was easy. At the bridge toll the fat kine was exchanged for the lean kine and two miles an hour was about the rate of progress. However, we wanted to look at the tea on some of the estates including Orwell, Sanquhar and Sogamawattie. So far we felt "sogam" because we had daylight and it was the first fine day for a long time! The scene is changed since we knew Ryan, Innman and Mason on the three above estates. The places have grown out of knowledge, particularly the two latter estates with over one thousand acres of tea between them and large factories. The tea is not as good as may be seen in Assam and seems to require manure in an old district like Pussellawa.—Rothschild we could not see at 7 p.m. We caught a glimpse of some of the fields next morning,

"And distance lent enchantment to the view,
And clothed the hills in all their verdant hue."

We should always associate Pussellawa with a big miscalculation we made of "*spending a happy day*" and going to bed without any dinner at 12-30 a.m.

We had also promised ourselves a great treat—to see the Ramboda Falls fall in their majestic glory; but the Fates denied even this and we could only hear them thundering above and below as the miserable hackery wended its way in the dark over bridges and culverts. We should never have fetched Ramboda with the two Gampola bullocks. An old planter was good enough to lend us a white coast bull who had to pull the Gampola bullock as well as the hackery. We paid ten rupees for twenty miles, according to agreement to the hackery man in addition to paying for two tolls and other small charges including one rupee to the driver of the white bull (being night work.) We regret very much passing through a large district like Pussellawa containing as it does over twenty thousand acres of tea and seeing so little of it. It is *a contrast to the good old days of coffee* when we often spent Christmas week up there and saw all the estates and all the planters of the district and *had a Government Resthouse* to rest our weary bones if unfortunate enough to be benighted. Ramboda was the first halting place from Gampola and here we enjoyed the hospitality of the oldest planter in the district, Mr. de Lemos who is still strong and hearty and walked to the top of the Condegalla Pass with me by the short cuts. Ramboda, including Bluefields, Condegalla and Labookelle all look in good order with nearly two thousand acres of tea between them and large factories. Westward Ho is a series of tea fields near the cart-road to Nuwara Eliya, the property of Mr. G W White.

We much preferred the old forest shade of Nuwara Eliya to the present innovation of much over-produced tea; and as we entered the Town of Nuwara Eliya we thought the ridges—planted with tea—no improvement whatever, but on the contrary robbing the Sanatarium of its original picturesqueness and pleasant resorts for family pic-nics.

NUWARA ELIYA

is very greatly improved as regards new buildings and the business appearance of the town, but we did not feel happy until out of civilisation and on the borders of the Lake where we found shelter for the night through the kindness of the proprietor of one of the snug cottages situated to the left of the Lake. We started at daylight for Uva and called in at the Hakgalla Gardens, but saw too little of them to make any comments, good, bad, or indifferent; we just went in at the grand entrance and out at another gate on to the Patana taking a short cut down to the cart-road from whence we came. Mr. Nock was engaged with a visitor and we much regret not seeing more of Hakgalla. There are many good vegetable market gardens between Nuwara Eliya and Wilson's Bungalow and great quantities of vegetables packed and labelled for Colombo. Cabbages, carrots, beet, onions and parsley seemed flourishing. We quite agree with your correspondent "Progress" that the Ceylon Government should construct a lake or large dam to hold the waters running to waste in one of the healthiest climates of the island. It would certainly attract settlers to that part of Uva between Nuwara Eliya and New Galway to Wilson's Bungalow and the desolate patanas would come under cultivation,

We were kindly received at Albion near Ambawela. The Railway Station is only five miles from the cart road. This must be a very great convenience to travellers and estate proprietors in the immediate neighbourhood.

Mr. A. J. Kellow has still some good coffee on his property and also some good tea with valuable orchard of English fruit trees. Mr. Kellow's coffee was very nice in the cup, and any of your readers wishing for *good coffee* would do well to try the Albion fragrant berry, the *old original Arabica*. Twenty-five acres still remain and seventy of tea. Beautiful English flowers do well here and are well cultivated. The climate of this part of Uva is delightful and the views of the mountain ranges surrounding are very grand indeed.

People who visit Nuwara Eliya should have a peep over the other side. Before dismissing Old King Coffee, we may mention that *the old king is by no means played out. He still lives.* We saw *good coffee* all the way from Gampola to Pussellawa almost free from disease. Our dear old friend H.V. was still there, but indulgent to coffee "within sound of the human voice." There is no doubt it likes to grow native fashion and cultivation and patent manures helped to kill it. We had a very long and hot journey from New Galway to Attampitiya, but were welcomed by our old friend Walter Stewart, one of the proprietors of the estate called Attampitiya. We were also glad to see another old planter, one of the pioneers of Haputale, Mr. MacPhail. The old Government rest-house has been purchased by the proprietors of Attampitiya and the new factory is some distance from the tea fields down on the cart road below the bridge, Attampitiya is nearly 400 acres of tea and is well roaded and drained. Over the gap there is a very good view of Narangalla and other Badulla estates.

The drive from Attampitiya was very enjoyable and we found old

BADULLA TOWN

very much improved with handsome buildings, shaded by beautiful trees including the Flamboyant. The Government officers have planted a large number of shade trees along the cart roads and they are doing well.

Dr. Johnson very truly remarked "that Regions Mountainous and wild form a great portion of the earths' surface and that he who has not seen them has missed seeing much of the nature." So it is with the mountains of Uva, thousands of acres exist which have never been cultivated and are comparatively uninhabited; and yet the climate is delightful, what can be the drawback? Is it the wind during the monsoon or is in the want of water?

The Ceylon Government could store the water and make this beautiful country inhabitable in the same way they have restored old tanks in parts of Ceylon where the climate is not so bracing and where the scenery is not so grand and picturesque in parts of the lowcountry.

The tea estates are few and far between and we passed underneath one with its factory looking like a "mansion in the sky" somewhere in the neighbourhood of Dickwella.

BADULLA TOWN,

with its new public buildings, pretty gardens and well kept lawns under grateful shades, looks better than ever and we enjoyed our breakfast at the resthouse after a pleasant drive from Attampitiya. Passing a very large factory near the town and over the bridge in the evening, we reached Telbedde the old property of George Wharton Brown, our little experimental garden adjoining we called Rorke's Drift in honour of Bromhead and Chard, is extended to sixty-four acres of tea and amalgamated with Telbedde. Another piece of land we cleared for tea in the seventies, called Carolina, has also been included and a large factory down in the hollow. Telbedde is over 450 acres of tea and the coffee all disappeared, some of the stumps still being used for firewood. Next morning we passed through Stisted estate, opened in the seventies by our friend L d'Espagnac, first in coffee, then in cinchona, then Liberian and other products, but now enlarged to a fine tea estate. Then we call at Mahapahagalla another old coffee property converted into a valuable tea estate of 250 acres. Stisted with 295 acres and Mahapahagalla with 252 acres under tea, make 547 acres of tea fields to travel through from Telbedde to Debedde Gap under the picturesque range of hills cal ed "Yerli Mallie" or seven hills opened by good old Geordie Morrice and profusely planted with fruit trees which I fear have disappeared for timber and tea bushes. Ury is now all tea and there is a factory near the cart-road.

Anotner of my experimental gardens named Cyprus in honour of Lord Beaconsfield is located at the 8th-mile post to the left. We remember taking Geordie Morrice to see Cyprus aud when he saw what a pretty place it was, he said "you are a baadly used mon' and we returned to Ury and that was the last we saw of good old Geordie who spent over 30 years in Uva.

Mr Moorhouse, junr., of Mapahagalla walked as far as Ury with me aud after rather a warm walk we pulled up at Passara. Mr. Stewart Taylor, now in charge, received me kindly and we had a talk over old times. There is a great change in this estate and very fine sheets of tea on the Gonakelle Group, 847 acres, with fine new factory fitted up with the best machinery, large withering house &c. In going for a walk round the lower tea fields we came to the boundary and saw another little garden called the Khyber Pass, a piece of land on the gap we bought at a Government sale; on looking for it, found a group of Afghans armed with sabres so we called it the Khyber Pass and planted it with cinchona succirubra. How many natives we have cured of fever with the crop it is difficult to estimate.

We had the pleasure of meeting Mr Mathew, the Assistant on Gonakelle (a son of the late Archdeacon Mathew who contracted a fever in the Northern Provinces and died very suddenly.) Mr. Mathew is very much like his father; we remember him very well in Colombo.

PASSARA

has now developed into a very important district containing over 5,000 acres of tea. The new bungalow near the factory on the Gonakelle Group is very substantial and a pretty piece of lawn well kept, improves the frontage surrounded with dense shade trees. The Lunugala and Badulla coach passes just underneath and blow their horns, announcing the arrival of the daily mail. "Things are looking up" as poor old Hebenton used often to remark in the old coffee days in Uva. After enjoying the kind hospitality of Mr. W S Taylor, we pass on to see some old friends, the Cottons, of Dammeria. This is another valuable property with great improvements made during the past twenty years—with 659 acres under cultivation, really a compact and pretty estate with tea looking very promising. A handsome new bungalow commands a comprehensive view of Peacock Rock or Monaragala. It appears that all the estates on this extraordinary formation are on the side facing Dammeria and the other side is sheer precipice. We met Mr. S Sparkes at Gonakelle and he was good enough to invite the writer to see some of the estates on Monaragala, so we must make up our minds for another long and warm journey on returning to Passara. Mr. J B Cotton was kind enough to drive me part of the road to Lunugala, putting me down at Galboda one of the properties incorporated in the Passara Group—including Galboda, Medumpitiya, Hanipha, and Polgahalande, comprising 500 acres of tea. Being alone on the Lunugala road I was unable to glean the amount of information regarding the new estates above and below the cart-road required to do justice to the great improvements made since I was last passing this way.

There are many pretty fields of tea and new bungalows and factories smoothing the monotony of this once rather tedious and steamy

JOURNEY BETWEEN BADULLA AND LUNUGALA.

One feels more inclined to be poetical when comfortable and riding is better than walking in a five-rupee pair of ammunitions.

Ramasamy does not grumble and he, poor fellow, carries all the kit on his head bare-footed, so why should your correspondent complain of a few nails sticking up in his boots and a blister occasionally, how nice it is to have a bath and a change after a troublesome journey ; yet after all said and done, there is no disputing the fact that riding is far and away better than walking especially in the tropics.

Well—"there is no rest for the wicked" and we go on like the Wandering Jew of E. S, (the name of the French Author is E. S.)

We pass through Hopton estate and between two small bungalows and sight old Clifton, the former some 400 acres of tea and Clifton, with Kehelwatte, about 340 acres. We remember John Darley on Clifton in the "seventies" and afterwards Carey. Coffee has given place to tea and is doing well.

When our old friend, G. H. Hall, opened Shawlands, he little thought it would some day be converted into such a large tea estate, now nearly 500 acres, with new bungalow and factory—the tea coming right down from a respectable elevation to the cart road. Poor old Hall : he died in the Straits Settlements somewhere, I believe in Perak—another good planter gone.

G. H. Hall was a regular correspondent of the *Observer* and often wrote some very smart things. He was a well read man and very good company, and we passed many pleasant evenings at Shawlands.

We were very sorry on arrival at the Park to find our friend, Fred. Hall, away from home, especially as we had walked ten miles in a very hot sun and we felt very tired indeed. However, we rested our weary bones that night. Next morning at 6 o'clock we made the ascent to Madulsima.

The view of the lowcountry from Madulsima is very grand with occasional glimpses of the silvery sea,and "Westminster Abbey" and "Friar's Hood," two well-known land marks on navigators' charts of the Eastern Province of Ceylon. From Mr. G B Cotton's bungalow we could see distinctly the little Basses' light with its minute and fifteen-second flashes or rather two fifteen-second flahes at intervals of about one minute. We will bring this letter to a conclusion now that we have arrived at Verela Patna.

There are only two old planters we remember up in Madulsima. In about six years the district has completely changed and a new generation has sprung up who knows not Joseph. We can look down on the Logaloya Valley, where we put in six years in the "seventies" before going into Government service at Perak in the Malay States.

Poor old Garrioch, Donald Reid, Sandy Brown, Ned Linton, Isham, Karslake, Dolly Osborne, Beneson, Richard Maut, Dick Sterling, and many others have been gathered to their fathers. Still the old district is flourishing, and risen out of its own ashes.

The new bungalow at Verela Patna is nicely situated commanding a very extensive view of the surrounding estates, including the Gonakelle Group—Part of Ury and the new tea fields of Mr. J Peris.

To the right, Sarnia and Dotlands, Ledgerwatte and Keena Kelle Group and Gampaha the back ground.

There will be many changes in and about Badulla within six months or so. Planters at home on leave will return to their change and their Locum Tenens will have to find new billets. Ceylon seems very full of Superindendents and Assistants just now and reauction of expenditure is the order of the day. South Africa after the War, may offer a new field for young men, and Canada can provide for those who can find a little capital. The Canadian Government give 160 acres of land in the Far West.

We regret to hear of Mr. Marshall's sudden death from lightning in Dolosbage.

The greatest improvements in the district of Madulsima is the substantial cart road with its new bridges and railed-in culverts passing through all the best tea estates.

Starting from Passara through over five hundred acres of tea on El Teb Group, and through over eight hundred acres of the Mahadova Group, including many well-known old coffee estates converted into tea plantations, entering the centre of Galloola and winding round Doomoo into Battawatte, forming a horse-shoe round the centre at Forest-Hill and descending through Wevebedde to Dunedin and Cocagalla Group. The Madulsima-Passara cart-road is eighteen miles in length and enables the visitor to the district to get a more comprehensive view of each estate without the fatigue of climbing up short cuts as in the old days of coffee planting.

We arrived in this district at a good time when the planters could meet and play at tennis on the Galloola Court, the annual holiday of Ramasami's

"TEEVALI,"

taking place on Sunday last and accordingly give the planters a little time to themselves, Teevali festival, however, seemed to me rather a quieter one than those we knew in the days of coffee. Ramasami did not seem so cheerful as usual and we were able to sleep through the nights which we expected to be disturbed by the beating of tom-toms. We heard no singing and saw no dancing. The old stick-dance seems to have gone out of fashion. Ramasami seems somewhat depressed and no doubt indirectly feels the general depression caused by the low prices of tea during the past year or two. We can remember when our old friend from the Malabar Coast of India sang his cheerful song when pulping his master's coffee and a hundred bushels of good cherry coffee pulped into fifty bushels of No 1 Parchment coffee was worth as much as four thousand pounds of green tea leaf made into one thousand pounds of "made tea." The coffee planter could call his soul his own in

THOSE GOOD OLD DAYS OF COFFEE.

but now he trembles when looking over the price-lists and tea sales and is often disgusted to find that although he has been plucking fine and reduced his crop of leaf considerably, his prices are no higher and sometimes his tea fetches less per pound than his neighbour who has not taken the same precaution of plucking fine.

If he gets better prices, his crop will turn out short of the original estimate; so it is as broad as it is long, whereas in the palmy days of old king coffee, crops would sometimes be purchased at one pound sterling per bushel before the crop was harvested. With regard to general cultivation, estates in Ceylon seem to be comparatively clean; it is an exception to rule to find a weedy estate. Tea, undoubtedly, covers the ground better than coffee and the shade trees dropping their leaves particularly the grevillea, keep the ground thatched and prevent weeds growing amongst the tea bushes.

Then, again, the estates are older and cannot grow the luxuriant weeds we had to hack down and bury and burn in the days of coffee. The old coffee planters made the roads and drains and put up the stores, bungalows, lines etc. Many old coffee stores have been converted into tea factories—in some cases into Crystal Palaces—light being a great factor in the manufacture of tea. The machinery for the tea factory is more costly than the coffee-curing machinery of old and many turbines are now used. There is a turbine at Galloola estate I saw working yesterday. Galloola looks better now under tea than when I saw it last under coffee. It is now a valuable property, although I believe in 1869 the coffee leaf disease first made it appearance in a field just in front of th bungalow. I remember Marshall Ward, th Cryptogamist from Kew, coming to see

THE HOME OF HEMILEIA VASTATRIX

and could suggest no remedy for combating the disease except burying the weeds and leaves of the coffee and keeping the ground swept clean of all prunings and rubbish. Both Galloola and Verelapatana are planted with high jât Assam Hybrid tea and both estates are very promising for both quantity and quality. Galloola estate has four hundred acres of good tea well shaded by grevilleas and other useful timber trees. Mr. Nuttall has returned to his charge and is a very popular man in the district, as also Mr. Mason of Verelapatana, who is living in a fine new bungalow commanding a grand view. The new V P bungalow, is above the old V P bungalow where the great Garioch once presided in Madulsima.

Sir Hercules and Lady Robinson once paid him a visit at

UVAKELLIE

and planted two grevilleas in front of the bungalow. There was an odd plant sent to Verelapatana and it is now growing on the site of the old bungalow, more than three feet in circumference. The grevillea was then almost a new introduction from Australia and was naturally thought a great deal of in those days. Now you find the grevillea all over Ceylon, grown for fuel more than for its grateful shade and fat leaves manuring the grounds. I am a great believer in the grevillea and notice it does not prevent tea from growing underneath it as some trees do, for instance the Casuarina or She-Oak of Australia and Noka Noke of the South Sea Islands. The five hundred acres of Verelapatana are in fine order and there is a steam engine driving the best tea machinery. Patent fans are to be added immediately, to facilitate withering, the roofs being of ceiling-cloth.

A large withering-house has been erected above the factory and four thousand pounds of green leaf can be converted into one thousand pounds of "made tea without overcrowding."

The moonsoon is now on and over two inches of rain per day have been registered on some days during November both on Verelapatana, Galloola and Battawatte estates, there is a good flush on the trees or tea bushes just now.

DOONHINDA

117 acres of tea, is included in the Doomoo Estates Company or worked with them by the same Superintendents. All the old coffee estates down in the Logaloya Valley, Gueltengawa, Deyanawatte and Allagallawatte are out of cultivation, though the two latter named places have been purchased and may be brought under cultivation again some day. The land is suited for tea, though the climate is unhealthy for coolies Battawatte and Forest Hill of the Estates Company of Uva, Ltd., 750 acres with 592 cultivated, of which 587 are under tea, with a new factory and withering house at the foot of the estate below the cart-road, are still flourishing under the supervision of Mr. A. V. Ryall. I accompanied that gentleman through Forest Hill this morning and saw the site of the old bungalow and the gap leading over to Uvakellie—another large Estate in the district

of Madulsima and a place we knew well in the days of Daddy Hamilton, the then Superintendent. We well remember.

DADDY HAMILTON,

the keen sportsman, keeping up with his dog round some of the steep parts of Forest Hill and on one occasion the writer got stuck on a slab-rock very slippery, unable to move up or down, and Hamilton came to the rescue just as it was getting dark, and we were glad to take his hand and be put on an old path. The last time we met was in Montserrat, on the Montserrat Lime Juice Company's estate, where Daddy was Manager and we went out to him to doctor the lime trees. Since then I believe Montserrat has been devasted by hurricanes. The inhabitants of Montserrat are Irish Niggers, they are very black, but talk with an Irish accent and rejoice in the names of Bourke, O'Bryan, O'Finuagin, Irish, &c. Some of them are well off, owning large sugar plantations. The Island is small, between St. Kitts Nevis (where Nelson married the widow) and Antigua, the seat of Government for the Leeward Islands. I went there in an open boat sailing past Guadeloupe, Martinique and Dominica from Trinidad. Perhaps Daddy Hamilton, once a great favourite in the district of Madulsima, will return to Ceylon and cultivate tea instead of lime juice. He was one of the Superintendents of the late R. B. Downall, who liked him none the less for being a good sportsman. I must bring this letter to a close and visit Cocagalla, Roeberry and Uva, a description of which will be given in my next. It is rather a rough journey and the weather is bad after mid-day; it is raining hard now.

Leaving my hospitable host, Mr. Ryall of Battawatte, a little above his tea factory, thereby saving a tremendous long trudge round the cart road through Forest Hill and a long swoop in the direction of Wevebedde or Tavellumplussie, down to Dunedin, we simply joined the zig-zag approaching the factory from the bridle path. To our minds this seemed to be the ugliest piece of the Madulsima cart-road, yet the object is obvious, being to pull up at the Cocagalla tea factory on the old and compact little estate known to coffee planting days as "Dunedin," now expunged from your Directory and amalgamated with the Cocagalla Group, formerly named the "Madulsima Coffee and Cinchona Company, Ltd."

We have a faint recollection that Cocagalla once belonged to Lord Lawrence, the Viceroy of India, before the Company was formed. We remember George Osborne as Superintendent of Cocagalla twenty years ago and the pride he took in his crack cinchona fields. There are still signs of them remaining on steep slopes now out of cultivation, suckers of cinchona succirubra and hardy hybrids, growing from the twenty-year-old stumps amongst the mana-grass and chena growth above and below the roads.

Queen tea is now supreme and little Dunedin possesses a hundred acres of a very fine jât and very healthy in appearance, some leaves as large as a man's hand and of good colour as well as strongly embossed. It is a very stiff pull up from the Cocagalla Tea Factory at Dunedin to the Cocagalla bungalow. There are some Jacob's ladders in the form of stone steps, but we preferred the bridle-path though exposed to the heat of a very hot sun. Of course, the tea is well shaded by grevilleas and other timber trees and is naturally more pleasant walking than the zig-zag paths on the exposed patana or mana-grass fields. As we neared the bungalow, there is another high class or good jât field of Assam-Hybrid tea looking remarkably healthy and promising good flushes since the North-East monsoon broke on the Uva ranges with thunderstorms and refreshing showers of rain generally falling in the afternoon and evening not much interfering with estate work. My old friend Mason gave me a letter of introduction (which I asked for) to Mr Williams; the letter to Mr John Williams introduced me to Mr Williams, jnr., now on

COCAGALLA

and I was made very comfortable for the rest of the day. It is the same old bungalow, on an excellent site, commanding a grand view of the estates around and the bright green patanas. The green tea leaf is shot down to the Factory by wire-shoots five in number, branching off from different stations; the bulk of the leaf travels by two very long shoots with patent rollers. It is very interesting to watch the bags swinging through the air at the rate of a mile a minute and coming down with a bump into each station and finally into the grand depôt or factory, withering house, built for its daily reception, where it is immediately spread out thin on the tats, a pound of green-leaf covering about six square feet of jute-hessian.

I did not enter the factory in the absence of some one to take me round. The fact of the matter is tea factories are all very much alike and I don't see why I should give the manufacturers of rolling machines, siroccos, steam engines sifting machines, &c., &c, a free advertisement every time.

I well remember taking a lot of trouble to advertise the tea roller when first invented in 1876 in Assam and received some very fine photographs of a new roller from the inventor, in Assam (then on a visit). I went so far as to send them to the Secretary of the Planters' Association of Ceylon and they were duly acknowledged by a special vote of thanks to your correspondent on his return to Ceylon, but within a few weeks from this time the inventor turned up to make a tour round the tea districts and to book orders. I met him in a bungalow somewhere, I forget where, and claimed his acquaintance, but he pretended to forget me, saying "I only saw you for five minutes."

The energetic superintendents of Cocagalla Group are making plenty of tea. The acreage of Cocagalla is one thousand one hundred and four with over six hundred acres of tea in bearing: added to this is Hewa Eliya and Elemane with another four hundred acres of tea, making a large charge of one thousand acres of tea in cultivation. We spent a very pleasant evening with Mr W A Williams and discussed many subjects of mutual interest. Next morning we rose early and with our mountain staff climbed to the top of Cocagalla estate and passing over the gap descended into Hewa Eliya.

With the exception of Hewa Eliya and Elemane estates, now under tea cultivation, all the old coffee properties between Cocagalla and Roeberry are out of cultivation. We remember many of them including Mousa and Kosgahadova, Quedgeley, Rathkele, and others, including some

two thousand acres of land under coffee and cinchona. Good old Roeberry has held its own through all these ups and downs of this far-off district known as Hewa Eliya. Roeberry estate, once the property of poor old Richard Mant, who toiled all his life in Ceylon and tried his best to make his fortune out of coffee and cinchona, sunk in the attempt like hundreds more of good men and true. Had Mant lived and developed this estate into its present valuable condition as a tea property of six hundred and fifty acres, he would have been a rich man; but "Man proposes and God disposes." It is a mystery how some men lead isolated lives and work so hard in tropical climates too, without winning the prize of independence in their old age. We all think we shall make our fortunes before we turn gray, but somehow some of us miss the mark. It is all very fine to say the "rolling stone gathers no moss;" but how often do we find the moss at a discount?

ROEBERRY ESTATE

is a beautiful place, shaped like a horse shoe, with lovely green patanas tapering down on both sides; and from the new bungalow, located on a lawn-like flat, there is a view of Namunukula range, Cocagalla, Doomoo, Galoola, Ury, Gonakelle, and other well-known Madulsima and Passara estates. Mr. John Williams is to be congratulated on his comfortable bungalow and its park-like surroundings, tennis court, kitchen garden, poultry house and stable, grazing ground for cattle, &c. A few Australian or English sheep with a few ponies would add to the homestead-appearance of this healthy corner of the Uva Province. Many of the Madulsima and Hewa Eliya bungalows, though occupied by bachelors, would do credit to married men, well-furnished drawing-rooms, dining-rooms and bath rooms close to the bedrooms. We are more civilised now on estates than in days gone by and, with the daily *Observer*, are kept well-posted up in the doings of the world. Mr Vaughan came over to Roeberry from Uva estate on the next range and we played tennis. Mr. Vaughan kindly invited me to visit him at Uva and we did so, Mr. John Williams accompanied me to the top of Roeberry, where Mr. Vaughan met us to point out one of the most beautiful views in Ceylon. The elevation was nearly 5,000 feet looking out on to the lowcountry Bintenne, the Rock of Bibile, Moneragala, Westminster Abbey, Friar's Hood, Horaborawewa lake further eastward, with the Logaloya Valley below us and a grand view of Haputale, Maturata, Hewaheta, the Knuckles and the Mahaweliganga flowing past us in the distance absorbing the Logaloya and Badulla-oya and on through the lowcountry to Trincomalie where the river empties into the sea. The view yesterday was magnificent, and we were indebted to Mr Vaughan for the trouble he took in meeting us and pointing out the different places of interest in so large and comprehensive a view of mountains and plains. The tea factory for final packing and despatch is called Arawa at the foot of Uva estate. From Arawa Factory the old Badulla road passes Megahagalla village on to Taldena village, then on to Badulla town. This old Badulla road leads to Alutnuwara, to the east of Horaborawewa lake. There is a "Dagoba" there and many Sinhalese visit Alutnuwara by this road. Uva estate is divided into three sections and being very steep requires a strong young planter like Mr Vaughan to manage it. The leaf is shot down by wire shoots strongly shored up by heavy weights and made fast by concrete. Timber is lowered from the top; the factory by the bungalow is built of stone and the tea despatched by wire shoot to Arawa Factory. There is an engine giving power enough for two rollers and other machinery. Everything is in apple-pie order and the tea of good sample in the cup, nice and creamy and golden colour—the best tea in the cup I tasted in the district. The jât is a good working Assam-Hybrid and the roads and drains are in good order throughout the estate. Kalugala is the chief point of the range. Out of 1,276 acres of land there are 471 acres of tea. There is a very large quantity of valuable timber grown on Uva and much cinchona scattered about in ravines and wind belts. We remember visiting Uva when John Stuart was in charge and James Reid (brother of the late Donald Reid of Galloola) was assistant on one of the divisions. The present Superintendent, Mr. Vaughan, is a C M I, and just about to attend drill at Nuwara Eliya. We spent a very pleasant evening together on Monday last, 18th November, returning *via* another *route* to Roeberry estate in rather heavy rain; on arrival at the bungalow a plunge bath prevented catching cold.

The leaf of Roeberry is shot down to the factory located between Lunugala and Bibile, the two villages and the factory forming a triangle. Karaghawella is the name of the village, eight miles from Bibile and Lunugala. The tea is then carted to Batticaloa and shipped to Colombo.

There are a few acres of cardamoms on Roeberry. HENRY COTTAM.

(To be continued.)

INDIA RUBBER IN NATAL.

ITS CULTIVATION AND PRODUCTION.

[By Anthony Wilkinson in the Natal *Agricultural Journal.*]

Some years ago I tried an experiment of planting an acre of "Manihot Glaziovii," or the Ceara rubber tree of South America. Mr Medley Wood, curator of the Durban Botanic Gardens, was kind enough to furnish me with roots and cuttings of Ceara trees from trees he had growing in the Gardens, and wished me to try an experiment on a larger scale. I planted an acre of Manihot with coffee plants between. The rubber trees grew well and seeded abundantly, and at four years old, when the trees got a good size, four to five inches in diameter, on scoring the bark to extract the rubber, although the rubber was of good quality and very elastic, the collecting or getting it was slow and costly. Accordingly, I came to the conclusion that the experiment would not pay, unless the trees could be tapped, and the juice collected in quantity, as is done in South America, and further, that Natal was not sufficiently tropical to make a good flow of sap. Coming to those conclusions, I cut the trees down, but still the trees come up again from the seeds every year, and grow luxuriantly five or six feet high in the first year, showing the climate to be suitable to their growth. Among my coffee I have a self-sown Ceara only three years old, and over 20ft. high. The red sandy soil of the coast such as that of the Berea, Durban, would be the most suitable. The seeds left to nature do not come up for a year or two. By some, filing is recommended, but this is a tedious process; tapping them with a small hammer until they crack serves as well, and is much quicker. The plan adopted to collect the

rubber, with the Ceara rubber trees, is to strip off the thin outer bark, which is like brown paper, and expose the green bark. This inner bark is then scored across with a knife at an angle, and the milky juice or sap then exudes and dries on in an hour or two, and can be peeled off and wound up in balls, but the process is so slow with the coolie women employed at 6d a day, that I found it would cost about 5s per lb. for the labour of collecting, and the product would be worth only about 2s per lb. Now it strikes me very forcibly that if a cheaper way of extracting the rubber were adopted it would pay well. The rubber is there of good quality, but the question is how to get it out. My idea is this: To plant the trees in rows, 12 or more feet apart, like large hedges, and at two or three years old, when large enough, in the spring or early summer, when the sap was rising, to slash off the small branches and leaves, and crush them in a small steam sugar-mill, and let the juice run into a tank of water. The residue of branches and leaves would then be put into a hydraulic press, with steam outside, and pressed as long as the sap would flow. The rubber juice would coagulate in the water, and could be raked out and squeezed by hand into balls and dried. By this method the trees would be pollared and dwarfed, and could be trimmed and cut once or twice a year, as found advisable. It would be necessary to keep the land well ploughed and scarified between the rows, for all would depend on the cultivation received. The rows, if in hilly land, would require to be run on the level, so as to cultivate cheaply with horses or mules. There are several other plants which would give good rubber if treated in this manner and well cultivated. The Beaumantia, a white flowering creeper of the order "Apocynaceæ," the Borneo rubber creeper, grows well here in Natal, and I have no doubt many native plants would be found to produce good rubber. If this plan of extracting rubber from the plant were found to answer, it would revolutionise the rubber trade in a few years, and rubber could be grown to any extent, like sugar. Moreover the supply of rubber, owing to the destruction of the trees, is decreasing, whilst the demand for the article, which is now being applied to so many different purposes, is steadily increasing, and therefore there is no fear of the market being over-stocked. India rubber being so valuable an article, worth £200 to £300 a ton, there is a large margin for profit. For an energetic young man wanting something to do and to try a new industry, I would recommend it, but remember the old American sage's saying: "Be sure you are right; then go ahead." I feel pretty sure there is money in it.—*Natal Mercury*, Oct. 29

NATIVE NOTIONS ABOUT TEA AND COFEEE.

Tea planters in India, unless they can discover new markets for their produce, are in a parlous way. Now, if it were coffee, Indians would take to it—as they have largely taken to it wherever possible—like a duckling takes to water. Coffee is a seed and the poor cooly can understand it containing some nutriment. But tea—Bah! It is only a leaf, and the golden liquor obtained from it is neither sweet nor intoxicating. Probably the way the *doraimar* drink it may make it good, but where is a poor cooly to get milk? And sugar? *That* is seen, and tasted, only during festivals and when it is offered to some great man as a peace offering. Then, it is so expensive! Tea may be bought for a few pies, or an anna in the bazaar, it is true, but then it has no taste, no aroma, and one might as well infuse blotting paper. The servants of large institutions and households gather up all the used tea leaves, dry them and then sell them to bazaar men, and with the proceeds buy coffee of some kind, which they can make drinkable at least. Tea is not in it. If tea is to be made popular it must be tolerably good, made up into small packets of an ounce or two, and sold cheap. Coffee is looked upon as a food by natives. A pound of coffee, at say six annas, with half a pound of coriander and half a pound of rice, all boiled, makes two pounds of powder, which will last a man, taking a drink twice a day, 15 to 20 days. A pound of bad tea can be got for six or eight annas, but it cannot be adulterated and is not half so tasty as coffee; and infinitely less nourishing. In Northern India coffee is not so easily obtained and tea is much more appreciated by the people, who are accustomed to drink hot drinks during intensely cold months. In regard to the tea habit, it may be interesting to speak of another community, the poorer members of which always drink coffee in preference to tea. I refer to the Eurasian and poor whites of this Presidency. Coffee is the staple drink, and is preferred—by the women and children at all events. The Colombo arrack which counts many victims in Madras is often given up for coffee. Coffee is a stimulant. Coffee is a drink on which one can stay. Some people make a compromise and use coffee in the mornings and tea in the afternoon. All this is to show that tea has much headway to make if it is to oust the favoured berry of Mocha, or to take the place of toddy or arrack.

It is my conviction that among the people of South India tea will never become a favourite beverage. My reasons for this are that, in the first place, the labouring classes in the Districts are too poor; in the next they are too conservative. There is one section of the South Indian population that may yield good results—the Mahomedans. The richer Mahomedans are all tea drinkers, and that being so, the poorer members may follow suit. But it is not good to despair. Very much depends on the way it is pushed. Coffee shops are common in towns, and if tea is sedulously advertised, who knows but that it will succeed?—*Madras Mail*, Nov. 18.

VANILLA CULTIVATION.

In our issue of the 9th May 1901, we published a special article regarding an experiment inaugurated this year in the gardens of the Agri-Horticultural Society of India, Calcutta, with a view to demonstrate the practicability of growing the *Vanilla planifolia* on a commercial basis in India. This week we paid a visit to the gardens, and were much pleased to note that the experiment has so far proved a complete success. The cuttings put down in April last have all struck, and the plants have climbed up the stakes, and have taken a firm hold of them. They have been trained along the horizontal stakes, and are looking healthy and vigorous. One plant has flowered. In March next most of the plants are expected to set flowers and fruits. We congratulate the Society on having established the fact that Vanilla cultivation canbe carried on in India with profit if planted on the lines of this experiment. An acre put down with Vanilla would prove a valuable addition to any tea estate in Assam, Cachar, Sylhet or Dooars, provided the manager knw how to fertilise the flowers to enable them to set fruit. The process is a very simple one, and can be easily learnt in a few minutes. It should be remembered that the *Vanilla planifolia* loves shade and moisture. These two conditions are essential to successful cultivation. Both era always available on almost every tea estate in our north-east province.—*Indian Gardening and Planting*, Nov. 21.

TEA FERMENTS.

The hunt for the tea ferment seems to go on apace. Some three years ago the theory of tobacco gaining its flavour from the ferment caused by bacteria, was widely circulated, and the idea was entertained by some that it might be the same with tea. The American Government took up the subject and employed Mr. C Loew, a botanical specialist, to conduct a series of investigations which he embodied in three Bulletins of the U.S. Department of Agriculture. He was unable to find any bacteria, and gave a long explanation as to why they could not be the cause, explaining how, under the conditions of manufacture, they were unlikely to live and multiply; but he isolated from the Tobacco leaf first an enzyme, then a perenzyme, and lastly a catalase, all belonging to the class of oxidising ferments. Soon after the publication of his first paper an enzyme, showing the same reactions as his, was demonstrated in the tea leaf. Now after the publication of his third Bulletin on Tobacco last year, he has left America and taken up a professorship at Tokyo, Japan, with the result that the Japs are likely to forestall us in the scientific manufacture of tea; as, in a Bulletin of the Agricultural College of Tokyo, recently published, Mr. Aso, evidently inspired by Mr Loew, has been investigating the difference in colour between green and black tea, and finds that the finished black tea contains much less tannin than the green. He also shows that the original tea leaf contained an oxidizing enzyme that is destroyed by heating at about 77° C. Also that during the fermentation of the leaf in manufacture of black tea, the enzyme oxidises the tannin, giving rise to a brown product. This is going rather further than anything that has been previously published in India, but we are glad to know that our investigators are not far behind, if they are not actually to the front, for one of them professes to have discovered an enzyme extraneous to the tea plant, which, like that found in tea, has the power of rendering the tannins and other cell contents soluble, and can be used to increase the power of the original article. He is evidently pretty confident of the results, as he has taken out a patent to protect his discovery, as we announced in a recent article. —*Indian Gardening and Planting*, Nov. 21.

THE NEW DIRECTOR OF THE COLOMBO MUSEUM.

Dr. Arthur Willey, of Cambridge, has, I hear, been appointed Director of the Museum at Colombo, Ceylon, which will be vacant early in the spring of next year. The appointment is under the Colonial Office, and is considered one of the best posts of the kind in the service. Dr. Willey is an accomplished naturalist. Zoologists will readily recall the excellent scientific work he did during the Cambridge zoological expedition to the South Seas in the years 1894-7. The main object of his journey was the investigation of the life history of the pearly nautilus, and his researches added very considerably to our knowledge of that little known genus. Latterly Dr. Willey held an appointment as lecturer in biology at Guy's Hospital, which he resigned on being appointed to a post in British Guiana, and he was about to proceed to South America when he heard of his advancement to Ceylon.—Local "Times." *Cor.*

PLANTING NOTES.

A FIVE-POINTED TEA LEAF.—A remarkable tea leaf has been brought under our notice by the courtesy of a Colombo gentleman. The leaf, which was brought in in a basket of leaf in the Agras, is extraordinarily malformed and consists of five distinctly formed leaves all joined together on one stem. One wonders how such a freak occurred and one also wonders how it came to be in a basket of tea! Alas!—has some one returned to eplucking?

GREEN TEA BULKING AT CALCUTTA.—The idea of a central green tea factory for Colombo was first advocated locally in a letter from America to a local firm which we published some months ago. *Indian Gardening and Planting* understnds from the I T A. Committee minutes that there is on the *tapis* a project for establishing a sort of central Hong in Calcutta for equalising, sorting and bulking green teas from various sources and placing them on the American market on the Chinese and Japanese system. It would be of great advantage to establish such a central factory in Calcutta, where half cured teas could be worked up into finished homogeneous breaks. The teas in bulk here, says our contemporary, could. in the final stages, be turned out far better under the eye of a practised expert for whom we would not have far to seek, and the result would be more satisfactory than that produced by many different planters making small breaks in the districts. The proposal has everything to recommend it and it is hoped to see some enterprising syndicate take it up.

TEA COMPANIES.—We publish in our daily reports concerning three Ceylon Tea Companies. Mr. J Holmes who presided at the sixth annual meeting of the Central Tea Co. explained the falling off in crop that there, had been in comparison with the previous season in consequence of the unfavourable weather, and the lower average price obtained. Money has been very wisely expended we think, in making necessary alterations to factories and machinery and in providing improved, and, in the end, cheaper, means of transport on Kahagalla. The condition of the estates, we are glad to observe, is satisfactory, and there is a gratifying improvement in prices. A very hopeful account is given of cardamom cultivation. The question of over-production is dealt with in a practical manner, the practice of manufacturing quantity at the expense of quality being condemned. It is also pointed out how we are benefiting India in exchange, and how the extra duty affects the cost of production. The Caledonian and Hornsey estates have also suffered from over-production and low prices, but a hopeful view is taken of the prospects as will be seen from the directors' reports. The directors of both Companies have expressed the opinion that the outlook for Ceylon tea is more promising than it has been for some time past.

THE INDIAN TEA ASSOCIATION AND GREEN TEA.

The Baraoora Company are in possession of the latest appliances for producing teas of the true unfermented or Ceylon type having intended for the Deane and Rae Green Tea-making mahcine advertised in our columns, some time ago. "Facing" is an optional process, and we may trust the able managers of the Company not to adopt any course that will injure the teas produced. They are moreover in possession of Mr: DrummondD eane's system of glazing or glossing teas, which adds much to their appearance and which may very properly take the place of "facing," without the introduction of any of the foreign ingredients which have earned faced teas a bad name. It is possible of course that some of teas offered for inspection by the Company may be made on a different system, but from the fact of their possessing the steamer we infer that part at least will be of the successful steam-made unfermented Japanese type, and these are certain to pass muster. Since the acceptance of the offer by the Indian Tea Association is contingent on the teas being 'suitable' we may be equally certain that whichever type of tea is found most suitable will be selected for the bulk of the Company's production, and the object of the Committee will be achieved. If 'faced' teas of China type are taken and wanted let them be made by all means but we very much doubt whether they will pass muster with the American authorities. A sample of North-Western faced Indian tea, which we recently submitted to Messrs Moran and Co., was at once rejected with the verdict "would not be admitted into America."

This important offer from Sylhet will be followed with interest. The disappointment of the Committee that more offers than these three have not been made hardly seem to us to be warranted. The amount of tea for which the grant is made is not very large and the three tenderers, all of whom possess Deane and Rae steamers to our knowledge could very easily produce all that is required each recouping themselves tenfold out of the bonus for the purchase money of the machines. Even on this scale, though, there is room for more enterprise and we are aware of many centres where the manufacture of unfermented green teas are being taken up on a small scale with a view to ultimately installing machinery, if successful in experiments. Indeed we have ourselves furthered these attempts by bringing intending green tea makers into communication with the inventor of the process. We expect to see the movement grow.

Another point of interest in the matter of green tea is that the local I.T.A. Committee announce that they intend to approach one or two of the larger agency houses with a request that they should take up the question of manufacture and bulking. If this refers to a project for establishing a sort of central Houg in Calcutta for equalising, sorting and bulking green teas from various sources and placing them on the American market on the Chinese and Japanese system, we are of opinion that no better scheme could be formulated. Indeed it is possible with advantage to go even further. Green tea differs from black in that, the manufacture may be stopped half way and the half cured leaf transported without risk of spoiling to great distances to be finished off at a central factory. It would be of great advantage to establish such a central factory in Calcutta, where half cured teas could be worked up into finished homogeneous breaks. The teas in bulk here could, in the final stages be turned out far better under the eye of a practised expert for whom we would not have far to seek, and the result would be more satisfactory than that produced by many different planters making small breaks in the districts. It is not likely that many will take up the manufacture in any but a small way at present and to produce the best tea it is necessary that it should be handled in quantities and on system. To steam and half fire is easy and could be carried out without trouble everywhere. The finishing processes could be better managed at a central factory which could be placed at any distance preferably at a centre such as Calcutta. The proposal has everything to recommend it and we trust to see some enterprising syndicate take it up.—*Indian Gardening and Planting*, Nov. 21.

THE NEW TEA DISCOVERY:

MR. C. R. NEWTON ON ITS SIGNIFICANCE.

We have pleasure in directing the special attention of the Ceylon planting community to the interesting letter Mr. Newton is good enough to send us on his discovery of a tea "enzyme" which is more or less essential to the process of fermenting tea. Mr. Bamber's opinion on the discovery, has created considerable interest throughout all planting circles in India; and Ceylon planters may rest assured that all the latest and most informing details, both in subject-matter and in criticism, will appear in this journal from time to time. Since we gave Mr. Bamber's views, nothing so much to the point has appeared in the local press as the letter to which we now turn our attention.

At the outset, we are glad to note that Mr. Newton entertains, as was only natural, the highest regard for Mr. Bamber's knowledge of and attainments, through original investigation, in the chemistry of tea manufactured. On the heels of this we are surprised to read that he has had "little experience with plant enzymes" or he "would not say they increase in quantity after plucking." Mr. Bamber's reputation is not likely to be shaken by such a statement, and we invite him to offer a reply on the subject; but meanwhile, referring to our article of the 13th ult., we cannot see that the matter clause, even, is at all well founded. What Mr. Bamber did say was that if the soluble ferment, the enzyme, in tea has any effect on the flavour at all, its *activity* was not apparent so much during growth as during the withering process. It was not a case of actual quantity of enzyme increased, but of a greater effect of the same quantity of enzyme in the tea leaf after plucking—when the withering stage was reached. Apart from this Mr. Newton brings out the full importance of the isolation of the enzyme in tea, if only this "soluble oxidising ferment" (as Mr. Bamber calls the substance he was able to separate from the tea leaf) can be produced apart from the tea leaf, and applied to it—to increase its flavour and develop its general excellence, aroma, and strength. Mr. Newton hopes that such a contingency will not come to pass because he fears a general levelling up of all kinds! But "much water will flow under the bridges" before that day arrives, or at least before the process of fermentation with external aid becomes sufficiently cheap to make the betterment of the tea involved decidedly profitable to the producer. Many will now look forward to the results of the experiments which continue uninterrupted

in Mr. Bamber's laboratory, with increased interest. Mr. Newton is unfortunately hampered from further progress in his researches, as far as manufacture is concerned, by the cessation of the Indian tea season; but we hope that those he will make in the laboratory may meet with success and further interesting results. Of these we shall be glad to learn from time to time, so as to keep the Ceylon planters constantly informed of the latest strides achieved by scientific work in the study of tea.

A GREEN TEA FACTORY FOR COLOMBO,

THE FIRST OF ITS KIND NEARLY COMPLETED.

BEING CONSTRUCTED BY MESSRS. FINLAY, MUIR AND CO.

Only a few months ago, as we had occasion to state this week, the idea of a central Green Tea Factory for Colombo was first mooted in these columns through an American letter. Definite particulars, however, of such a factory being started, have since been wanting and it was not known by whom the first enterprise of the kind would be promulgated, nor where the factory might be erected. Rumours had been abroad that one would shortly be commenced, but the task of tracing them had so far baffled us, until this morning a representative of the *Observer* was attracted by the red-brick columns and walls, and the massive iron beams, of a building in course of erection in the yard behind the stores of Messrs. Finlay, Muir & Co. in Vauxhall Street. Enquiry elicited from an intelligent workman, busy engaged on the structure, that the building was intended for a Factory for the manufacture of Green Tea; that in the course of a few weeks it was expected to be completed; and that on its completion the production of "greens" would be immediately commenced. The structure, the better part of which is now erected, is an extensive and commodious one. From end to end it measures 200 feet by 40 feet, while in addition along half the length of the building (100 feet) on the side facing the stores, a verandah 25 feet wide will be erected. The Factory is, we further understand, to be appointed with the most modern and approved machinery of British manufacture, some of which has already arrived and is lying by ready for erection. The building, it is expected, will be completed, and work commenced before the end of the present year. The system of manufacture will, we learn, be the same as that followed in Japan. The leaf will be partially treated on the upcountry estates of Messrs. Finlay, Muir and Company, to allow of its being conveyed by train to Colombo, and then finished in the Colombo Factory ready for despatch to the markets awaiting it.

AMERICAN SCIENTISTS IN SUMATRA.

Dr. H M Hiller and Mr. A C Harrison, the American scientists who have been exploring and investigating zoological and ethnological matters in Sumatra, returned to Singapore yesterday after a most successful stay of over three months in the Dutch possessions. They have brought back a large collection of valuable specimens which will mostly be presented to different scientific institutions in the United States. Dr. Hiller and Mr. Harrison leave for America *via* Japan by the German mail steamer "Koenig Albert" on Friday (22nd inst.)—*Straits Times*, Nov. 19.

RAILWAY CONSTRUCTION IN NYASSALAND: THE NEW LINE.

A contract for the construction of a railway between Chiromo and Blantyre, with provisions for an extension to Lake Nyassa, has just been concluded between the Imperial Government and a company registered under the title of the Shire Highlands Railway Nyassaland (Limited). During the past five years proposals for such a line of railway have been repeatedly laid before the home Government. The carriage of goods through the Protectorate is, at present, conducted altogether by native porterage—a slow, costly, and ineffective process. Under the agreement now entered into between the Imperial Goverument and the Shire Highlands Company, the railway is to be constructed on the 3ft 6in gauge with a single line and is to lie wholly within the Protectorate. This line of railway between Chiromo and Blantyre will connect the centres of the coffee industry with the sea by way of the Shire and Zambesi rivers and will otherwise benefit the chief industries of the country by releasing for labour in the plantations the natives who have hitherto been engaged in transport work; and when the Lake Nyassa extension is built a valuable trade route of some 1,200 miles in length will have been established through the heart of the lake country. —*Globe*, Nov. 8.

"COOPER, COOPER & CO."

Cooper, Cooper & Co. (1901), Ld, (71,774).—Registered Nov. 2, with capital £70,000, in £1 shares (20,000 pref), to acquire the business referred to in agreements (1) with the Le Vallon Synd. Ld, and (2) with J C Goode, and to carry on the business of merchants, traders and dealers in tea, coffee, cocoa and all kinds of produce, wholesale and retail grocers and provision merchants, restaurant keepers, refreshment contractors, licensed victuallesr and buyers and sellers of and dealers in merchandise, goods and property of any description. The subs. are:

	Shares: Pref	Ord.
F Kempson, Crow Lees, Springfield Rd, Leics	1,000	250
J C Goode, 29, Mincing La, E. C., mcht. ..		5,000
N F Nalder, 94, St George's Sq, S. W., mcht		250
L E Thornton, 8 Montagu Sq, S. W., gent		250
J C Wells "Tattershall," New Bannet, Herts, gent		250
E J Davis, Granville House, Granville Place, W., barrister	100	
H G Hemmerde, 18, Cyril Msions, Battersea Pk, secy		10

Minimum cash subscription 200 shares. The no. of directors is not to be less than 3 nor more than 6; the first are J F Kempson, J C Goode and N F Nalder; qualification £250; remuneration £100 each per annum. Registered by Hollams, Sons, Coward and Hawksley, 30, Mincing Lane, E. C.—*Investors' Guardian*, Nov. 9.

THE NEW GREEN TEA FACTORY.

Since publishing our article announcing the erection of a green tea factory in Colombo, which by the way was by a couple of days the first public intimation made of this new and important departure, information has been supplied to us to the effect that the mansufacture of tea in the new factory will be superintended by a Chinese expert who has had extensive experience in his own country and in Japan. This gentleman, who was in Colombo about nine months ago when the matter first began to be contemplated by Messrs. Finlay Muir & Company, giving his advice, is now daily expected to arrive and will personally superintend the arrangements and fitting up of the machinery With the new factory in full working order,. Canada and the States need have no fear that Ceylon greens will not be turned out in a manner suitable to the most fastidious taste, accustomed only to Far Eastern manufacture. They are convinced of this and once the local enterprise is proved successful we foresee prosperity for the Green Tea industry in our midst, and increased progress for blacks in the world's markets owing to the relief effected in the supplies.

"THE TEA SOILS OF ASSAM.'

We have to thank the Secretary of the Indian Tea Association for a copy of a pamphlet containing a most interesting paper on "The Tea Soils of Assam and Tea Manuring" by Mr. Harold H. Mann, B.Sc., Scientific Officer to the Association. The pamphlet is illustrated and from it we quote the following :—

SUMMARY.

Summarising therefore it may be said that—(1) The older parts of the Assam gardens are gradually deteriorating in yield and it may be also in quality. (2) It is unsound to try and make up for this loss in yield by putting out new clearances. (3) This deterioration can be largely stopped by the judicious use of manures, principally obtained locally. 4) No new clearances should be put out unless the old area is producing its maximum, or it is intended to abandon an area equivalent to the new clearance. (5) A system should be laid down for the future pruning and treatment of every plot on a garden, only to be departed from for very trenchant reasons.

PRODUCE AND PLANTING.

The following remarks about packet tea and the Merchandise Marks Act appear in the annual report of Mr George F Allwood, inspector of weights and measures to the Wolverhampton Corporation: "Local conditions have operated this year to necessitate the institution of legal proceedings in regard to packages of tea sold and exposed for sale upon which the weight was marked. A common custom now in vogue is for large firms of tea-dealers to import consignments of tea in bulk, and cause it to be wrapped in packages of various weights from 1 oz to 1 lb. These packages are then despatched for sale by the numerous small shopkeepers, who retail as received. Several quantities of these weight-marked packages have from time to time been tested in the shops, and the results go to show in some instances a large proportion of the packets were deficient in net weight. It is considered desirable, wherever blame appears attachable, to proceed against the wholesale dealer. Great difficulties, however, are found to operate against this being done with the prospect of a successful termination. Under this Act, if a defendant can prove to the satisfaction of the court that he has taken reasonable precautions to ensure full weight, he is exonerated from liability. The two cases dismissed were in this manner adjudicated upon, although the retail shopkeeper was shown to be in possession for sale (in one case) of no fewer than thirty-four packets short weight, out of a total of forty-two tested. The cases against the shopkeepers were then withdrawn, although it is only a fair requirement that these traders should take the precaution of ascertaining how far such weight-marked packages are safe for sale before offering them to the public. How important a matter the subject dealt with in the above paragraph is will be fully realised when I mention it was stated in evidence that one of the firms concerned disposed of no less than 20,000 marked packets per week—and this by no means a leading firm in the tea trade!"

Commenting on last week's tea market, the "Produce Markets Review" says:—"The market for Indian teas has been less active, and a considerable quantity of the larger supply was withdrawn from the public sales, as the prevailing fog made it difficult to value the teas. Prices for the common grades are easier, more tea being obtainable at 5½d and under. With a continuance of lower values the demand will probably materially increase, as several of the larger buyers of these descriptions hold only moderate stocks. The medium and finer qualities have shared in the decline which will probably prove, but temporary under more favourable conditions for dealing with the teas. The stock is about 8,000,000lb larger than last year, which is mainly accounted for by the quicker transit, severa of the districts being able to forward their teas two or three weeks earlier than in former seasons. Although the market for Ceylon teas has been only poorly supplied, a flat tone was displayed at the sales on Tuesday, and a lower tendency generally was manifest. This was most apparent in whole leaf descriptions from about 7½d downwards, and these in some cases showed a fall of ¼d to ½d per lb. There was, however, very little sold under 6d, this being practically the lowest quotation."—*H. and C. Mail*, Nov. 15.

THE ACETYLENE LAMP TO KILL TEA BLIGHT.

MORE ABOUT THE APPARATUS.

CONSTRUCTED FOR THE GOVERNMENT ENTOMOLOGIST.

We had the pleasure recently of inspecting the simple apparatus which Mr. E. B. Creasy has constructed for Mr. E. E. Green, Government Entomologist, with a view to the destruction of tea blight and insect pests. To begin with the generating chamber itself: this, we saw, is a light tin vessel containing two chambers, in the inner one of which gas is generated through the contact of water with calcium carbide. The water remains in the outer chamber, but is so connected with the inner [one—up which passes a series of spiral trays bearing

the chemical required—that the production of gas is continuously going on. A tube on one side connects with a safety valve through which the gas, if over-produced, is allowed to escape. The chamber containing the gas in the centre of the generator rises automatically with the gas produced. On the other side from the safety valve, is a tube connecting with the inner chamber, through which the gas is borne off for consumption.

The whole generator weighs a very few pounds and can be conveyed about the estate by any ordinary cooly. The destructive apparatus itself consists of a tin basin soldered on to the end of an alavanga, a burner passing up through the basin-centre, attached to the end of a tube—which for a few inches passes down along the alavanga and then connects with a rubber tube leading from the generator. The basin contains water and a little kerosine oil on the top. When the burner is lit, a flame of about 50-candle power is produced, and though we were not able to see the apparatus working last night, a wet evening having been threatened, we were told by Mr. Creasy that flies and insects of various sorts have already proved their affection for the powerful light emitted by the acetylene flame, and fallen in quanities into the kerosine oil in the basin round it. This successful result is most noticeable on the darkest nights. The apparatus is extremely simple and for planters who find their bungalows dull of an evening, few more interesting excursions could be made than with cooly, generator, basin, and acetylene flame—to collect and kill their vile enemies, tea blight and insect pests.

CEYLON TEA AT ODESSA.

Mr, Consul-General C. S. Smith, in his report, states that the tea trade during the past year was very bad in South Russia on account of the universal scarcity of money and the bad harvest. " Ceylon and Indian teas are far stronger than Chinese tea, so that if consumers took to then use only half the quantity would be required. Though the consumer may not be aware of it, Indian and Ceylon teas are already largely used for mixing with China teas. It is likely that Indian and Ceylon teas will gradually make their way in the Russian market, but at present, as they are only required for mixing, only particular kinds find a market. Planters who wish to send tea to Russia would do well to employ a regular exporting house for the purpose, and no doubt would recognise that uniformity of quality is much to be desired."—*L. & C. Express*, Nov. 15.

GAME PRESERVATION IN INDIA.

PROPOSED LEGISLATION.

Calcutta, Dec. 4.—The Government of India has under consideration the question of taking steps to prevent the wanton destruction of game in India, and a Bill for their protection, on the lines enunciated by Sir Allan Arthur in his speech in the course of the Budget Debate last year will, in all probability, be brought forward during the ensuing session of the Legislative Counci in Calcutta.—*Madras Mail.*

MR. CHAMBERLAIN ON COOLIE LABOUR.

ADVICE TO WEST INDIAN PLANTERS.

The West India Committee has received the following letter from the Colonial Office :—

"I am directed by Mr. Secretary Chamberlain to acknowledge the receipt of your letter of the 28th ultimo, on the subject of the payment by the planters of Trinidad of such portion of the cost of the repatriation of coolies is not payable by the immigrants themselves. I am to point out that such payments from the planters will only be demanded in respect of coolies introduced in the season 1902-3 and following seasons, and not from 1898, as stated in your letter. With regard to your suggestion that the right of the coolie to an assisted return passage should lapse if not exercised within two years of the completion of his period of industrial residence. I am to observe that such a limitation of the immigrants' rights could not be introduced without the consent of the Indian Goverment. Mr. Chamberlain proposes shortly to approach the Indian Government on the subject in connection with a similar proposal emanating from the Government of Jamaica. but in the meantime he would be glad if the West India Committee would consider whether the effect of the change you propose might not be that nearly all the coolies would elect to return on the completion of ten years' residence, instead of as at present remaining, some for many years, and some for ever; so that the result would be to substitute for a prospective and contingent liability an immediate charge of almost equal amount.—I am, &c.,

—*Daily Chronicle*, Nov. 12. "BERTRAM COX."

"THE TEA SOILS FOR ASSAM."

We have carefully perused the excellent little work on " The Tea Soils of Assam " by Mr. H. H. Mann, B.S.C., received lately from the Secretary, Indian Tea Association, but do not propose to enter into an extended review of it—a task which only an expert in the subject would be capable of usefully perform ing. Mr. Mann, in his introduction, wisely points out that though the essential importance of suitable soil for tea is pretty generally known, he has noticed (in Assam, in three years) numbers of pieces of tea put out without reference to the character of the subsoil, afterwards proved unsuitable He is of opinion that Assam gardens do deteriorate, with age, and therefore require culture. He was surprised to note the carelessness with which cattle manure (available at 1,000 lb. per annum per head of stock) is preserved for use. Mr. Mann deprecates the Assam system of constant extensions and abandonments, and maintains that extensions are inexcusable unless the tea already in existence is producing its maximum of best quality tea. Mr. Mann's usefully summary regarding Assam we quoted when acknowledging his book; he points out the high importance of the independent results arrived at by Mr. Bamber, regarding tea soil and the relation of soil to quality, but regards them altogether as forming "a most inadequate commencement to the study of the most difficult parts of the tea culture." The first, third and fourth chap-

ters of the work under notice deal with :—(1) Assam soils, (3) Manures available, (4) Notes on the tea soil of each Assam District. These are mainly special to the great Indian tea region. But the second, which takes up "Chemical Characteristics," contains much that is of universal interest. This we have carefully extracted and quote in our daily and *T.A.* The point, we notice, most emphasized is that it is not alone *what* chemicals a soil contains, but *how they occur* there, that determines their effect on and usefulness for tea; sandy soil contains chemicals in the free state, but in clay, combined, and therefore not so readily nourishing the tea bush. We commend the additions Mr. Mann has made to the study of tea soils to the attention of all interested.

CHEMICAL COMPOSITION OF TEA SOILS.

(From "The Tea Soils of Assam" by Mr. H. H. Mann, B. Sc.)

Both Mr. Bamber's and my own results are however almost entirely derived from analysis of soils obtained from various tea gardens of Ceylon and Assam, and it remains to consider how far such analyses can be of value in the decision of such points as the suitability of land for planting, or the manuring requisite for such land. In considering Assam soils one is met at the outset by a difficulty, judged by all standards of English agriculture. Many of the best tea-soils, as shown by the percentage figures, seem much poorer than would be expected of virgin and good tea yielding land, and poorer even than other soil which is really much inferior for tea production. It would seem, at first sight, that analysis is of no value here, and that the poorer soils chemically are the better ones actually and agriculturally. But if these analyses be considered in another way the apparent contradiction disappears. There is in every soil a very large amount of sand which acts as a support to the plant, but in every other respect merely as a diluent of the valuable soil constituents. It would, therefore, seem that in order to ascertain the real actnal richness of the soil for plant production, one's figures should be calculated not on the soil as a whole, but on that part which is not sand. What previously seemed to be the worst soil by far, now proves richer in every important ingredient (save the Potash). This is so universal in Assam soils, that one may lay down as a general rule that the power of land to produce luxuriant tea must in the future be determined not by the percentage of valuable matter in the soil as a whole, but rather in the soil less the sand, which latter acts in large measure as a diluent of the other materials. But in this argument we have lost sight of one important matter. While the amount expressed in percentages of the soil as a whole may not represent the power of giving luxuriance to the plants, it undoubtedly shows the extent of the soil resonrces, *i.e.*, the ultimate amount of plant food contained in the soil. Such a conclusion would be justified if the soils were of the same depth, and if the roots penetrated as easily in one as in the other. And in practice the conclusion is shown to be just by the rapid exhaustion of sands overlying clay, which at first give exceedingly luxnriant and fine tea, but which become exhausted more rapidly than any other type of land in Assam. Though, calculated in the non-sandy part of the soil, they were very rich to start with, yet the total amount of plant food was small, and was rapidly exhausted, while the roots were unable to seek fresh supplies further afield because of the underlying clay. In the example I have taken, however, it is otherwise. The soil No. 1 has at least twenty feet depth of soil in which to range without meeting clay or water, and hence produces luxuriant tea at the beginning, and in addition lasts an almost indefinite time.

We have therefore to consider in a soil analysis :—

1. The concentration of the soil constituents, *i.e.*, the amount of the valuable matters in the part of the soil other than saud. This determines the luxuriance of the plants and probably the valne of the tea.

2. The absolute amount of the ingredients of value as represented by the percentages in the soil as a whole. This determines the permanence of the plant without manuring, but only if taken in conjunction with.

3. The available depth of the soil, which may counterbalance the apparent *absolute* poverty (No. 2) of the land if this depth is sufficiently great.

METHODS OF TAKING SAMPLES OF SOIL FOR ANALYSIS.

In sending a soil for analysis, therefore, in order to satisfy consideration No. 3, the character of the subsoil should always be stated, and in addition the depth of the subsoil water, as these may have a paramount influence in determining the meaning of the analysis. The actual sample sent should always be taken in the following manner. Dig a hole in the plot of which an analysis is desired, fifteen inches deep, leaving a block in the centre of the hole 6 inches square. This block is therefore 6″ by 6″ by 15″ in size. Have a box made of these inside measurements and invert it over the block of soil, and then removo the whole,—box, soil, and all,—by putting a spade underneath the block. Then fasten a cover on the box and send to the analyst, marking the end of the box which contains what was originally the surface soil. The analyst has thus a block showing the layers of soil as they occurred *in situ* down to 15 inches deep, and valuable results may often be drawn from mere observation of them, which would be entirely missed if merely a shovelful of soil down to the same depth were sent for examination.

IMPORTANCE OF VARIOUS SOIL CONSTITUENTS.

Although the constituents always present in soil are many in number, yet those which have any interest from an agricultural point of view are comparatively few. Some seem to bave no necessary functions in regard to plant life. Such are the silica, the alumina and the soda. Others are, one may say, always present in far greater amount than the plant requires. Such are the oxide of iron, the magnesia, and the Sulphuric acid, but with these constituents it may be that they have to be present in some particular form to be useful to the plant, and thus they may be an essential element in the fertility of a soil. And third there are those ingredients required by every plant, and upon whose absolute and relative quantity depends primarily the fertility of the land. Such are the organic matter, the lime, the phosphoric acid, the potash, and the nitrogen.

ORGANIC MATTER AND NITROGEN.

These two constituents of the soil are intimately connected. In fact the total useful nitrogen in the soil is or has been contained in the organic matter. I say "has been" because at the time the tea plant utilises it, it nsually has been converted into nitrates by the microbes of the soil. For many years it has been supposed that this conversion into nitrates always took place before absorption of nitrogen by the plant, and it is only recent investigations which seem to have shown that the nitrogen in the organic matter itself without previous change, may form the food of plants. The determination of the nitrates actually present in soil generally, however, gives little information as to the resources of the soil in food supply since the nitrogen in this form in so soluble a condition, that the first rain storm may wash the whole into the drains. The permanent supply of soil nitrogen is that contained in the "organic matter" or "humus," and

the amount of organic matter and the nitrogen form the first and most important measure of the fertility of a soil for tea, of the likelihood of its being of permanent value, and also of the probability of its giving high quality tea. Unluckily the amount of organic matter is one of the most difficult things to measure, and the figure in the analyses called by that name is only valuable when a similar class of soils are compared. These constituents are however so essential and important that, unless they are present in large enough quantity, the other ingredients of the soil are all but useless.

"LAW OF THE MINIMUM."

But organic matter and nitrogen are not the only constituents required in the soil for the production of healthy and luxuriant bushes and of high quality tea. For both these results they occupy essentially the most important position, but without other ingredients they would be utterly useless. There is a law in agriculture known as the 'law of the minimum,' which states that if the minimum required by a plant of any constituent be not obtainable, all others are there in vain and the plant cannot be grown. Inasmuch as the tea plant requires Phosphoric Acid, Potash, Oxide of Iron, and Lime at least, and probably Magnesia as well, it is absolutely necessary that these should be present in sufficient quantity and in a sufficiently available form for the plant to grow well. I say 'in a sufficiently available form' because they may and often are present, but in such a condition that the plant cannot use them. Thus, for instance, the quantity of potash in a clay soil is invariably several times greater than in sandy land, and yet the latter may be actually richer agriculturally in this constituent at any particular moment than the former, simply because in the former case it is so combined in the clay as to be in large measure useless for the plant: again, Phosphoric Acid is always less useful in the presence of large quantities of Oxide of Iron and Alumina than in their absence, &c.

RELATION OF PHOSPHORIC ACID TO QUALITY.

Why does Phosphoric Acid play such a preponderating part in the production of high quality teas? No albumens, no cells, and hence no tissue can be formed in its absence. Now as those parts of the plant used in tea manufacture are those in which the production of new cells is extremely vigorous and energetic, so is this constituent of more importance for the perfect production of the crop than with ordinary agricultural products. There is another reason also. It has recently been shown that the acidity of plant juices depends on the amount of Phosphoric Acid in the soil. Now the younger leaves and hence those which make the best tea are more acid than the older ones, and so one is, I think, entitled to assume that a certain proportion of acidity is necessary in the leaf for making the best tea, and this is rendered more certain by the presence of much Phosphoric Acid in the soil.

POTASH.

The constituent next of importance to the tea plant is without doubt the Potash. Its function in the plant is most important, and there is little doubt that it plays a fundamental part in the production of tannin (the essential element in the pungency of tea), as well as in the formation of albumens and the production of new cells and new growth.

BALANCE AMONG SOIL CONSTITUENTS.

Finally, what seems of greater importance for the luxuriant growth of high quality tea than the presence in large quantity of any particular constituent, is that the constituents of the soil should be well balanced—that is, that it should contain enough organic matter and nitrogen to satisfy the utmost needs of the plant (say not less than 0·8 per cent. of nitrogen calculated on the soil less the sand), and then a sufficient quantity of other constituents to prevent the plant having any trouble in obtaining them. If there is a large quantity of readily available nitrogen—with the necessary organic matter—and not sufficient readily available Phosphoric Acid, etc., there will probably result a rank growth giving sappy wood, and leaf without the special qualities of high class tea. If, on the other hand, the nitrogen is too small in amount and the other constituents in excess, a high quality tea will be produced,—but only little of it. And further if both nitrogen and phosphoric acid are low, then neither luxuriance nor quality are obtained, and the garden is worn out—becomes the prey to blight after blight—fills with vacancies and probably ultimately disapears or is abandoned.

OUR BELGIAN SCIENTIFIC VISITOR.

M Lippens, our Belgian scientific visitor, is immensely charmed with his visit to Ceylon and looks forward to revisiting it at a later date. Meanwhile he proceeds to India and Burmah, studying tropical products as he goes, and afterwards to Java, Sumatra, &c. before returning to Belgium and thence to the Congo—to introduce new products. M Lippens, we may add, is correspondent to that famous continental paper which has made so many startling but often correct announcements during the war, *L' Indépendance Belge*, which, unlike the *Petit Bleu*—a purely popular paper—is the medium for communications from all classes of impartial and cosmopolitan critics of national and international events.

SIR HARRY JOHNSTON ON "UGANDA."

BEFORE THE GEOGRAPHICAL SOCIETY.

The opening meeting of the new session of the Geographical Society was held last night in the theatre, Burlington-gardens. The president, Sir Clements Markham, was in the chair, and there was a very large audience.

Sir HARRY JOHNSTON delivered a lecture on "Uganda Protectorate, Ruwenzori, and the Semliki Forest." The lecturer took the Uganda Protectorate province by province, and gave original information about each province in turn.

THE PROVINCES

are six in number—Eastern, Rudolf, Central, Nile, Kingdom of Uganda, and Western. He said that the traveller from Mombasa, before reaching the frontier of Uganda, passed through the country of Kikuyu, which was well forested and thickly clothed with vegetation. As he descended into the Rift valley the Kikuyu vegetation decreased in luxuriance. In the vicinsiy of Lake Naivasha there was a short sweet grass, which was probably kept low by the browsing of innumerable antelopes and the herds of Masai cattle. The Masai of the Naivasha, district belonged to the essentially cattle-keeping sami-nomad division of that race. Quite recenty, for political reasons, it had been thought advisable to make the Masai dwelling within the eastern province of the Uganda Protectorate independent of any political connexion with those of the adjoining East Africa Protectorate or of German East Africa. Unfortunately at the present moment the Masai race was on the road towards extinction, either by dying out or by fusion with other tribes. The last year or so, however, there had been a marked increase in prosperity among the Masai of Naivasha, and he was therefore in hopes

that in this region they might increase and multiply and preserve their purity of race. From the north-eastern buttresses of Mount Elgon, and the headwaters of the Weiwei river on the north, to the frontier of German East Africa on the south—a distance of about 240 miles—extended at altitude ranging between 5,000ft. and 10,000ft. one of the most beautiful and healthful districts to be found anywhere in the Dark Continent. This lofty region he would style the Nandi plateau, as it was mainly inhabited, so far as it had any human inhabitants at present races of the Nandi stock. The scenery on the Nandi plateau reminded the homesick official and traveller over and over again of England, of Wales, of Scotland. This beautiful land had not in it a single ugly or unfriendly spot, and as it was almost entirely without native inhabitants it seemed to be awaiting the advent of another race which should make it a wonderland of wealth and comfort, a little England, half a Scotland, or a large Wales lying exactly under the equator at an average altitude of 4,000ft. above the Victoria Nyanza, of whose silvery gulfs and ghostly mountain coastline strange glimpses at a distance of 90 miles might be caught occasionally from some breezy height or through the interstices of woods which themselves might be in Surrey. He travelled completely round Mount Elgon. On its southern as on its northern side the awful mountain cliffs which marked one of the lower terraces of this tremendous crater were honeycombed with deep recesses or caverns.

IN THE FOOTSTEPS OF JOSEPH THOMSON.

These were the well-known caves of Elgon, the eaves which were first discovered by Joseph Thomson. He visited several caverns, but among others the one which was the first cave reached and discovered by Joseph Thomson, whose visit the natives still remembered vividly. This cave was marked by a splendid waterfall. It was the descent of the Sasuru river, and he would propose to name the waterfall the Thomson Falls. It was hardly necessary to add that Joseph Thomson left behind him there, as wherever else he passed in Central Africa, the most pleasing memories. Fate had ordained that he should often travel in Thomson's footsteps, and he had always noted that where Thomson had been the first white pioneer his admirable treatment of the natives had ensured a kindly welcome to those who followed. The native inhabitants of West Elgon were of the greatest interest. They were of rather a mixed stock, but all were of very low and ape-like appearance. The greatest interest they possessed lay in the fact that they spoke a Bantu language which, of all those discovered, possibly came nearest to the original form of the Bantu mother tongue.

THE FIVE-HORNED GIRAFFE.

From the Sabei country he was obliged to travel for 16 days to the ravine station without a road, simply guiding his caravan by the map and eye. From the north-east of Elgon to within sight of the ravine station they passed through a land whose only human inhabitants were a few wandering and fugitive Andorobo—a land simply swarming with big game. They saw large herds of elephants first, then many rhinoceroses, then literally countless hartebeestes, water-buck, reed-buck, Cobus antelopes, bastard hartebeetes, and oribi. Herds of zebras would follow the caravan, snorting and kicking up their heels. There were lions leopards, warthogs, jackals and many ostriches. Last of all, in the middle of the Gwas 'Ngishu plateau, where forests of acacia still lingered, they came upon giraffe, upon that five-horned giraffe which appeared to be a new species of that remarkable animal and apparently the common form of giraffe between Elgon on the west and Lake Barugo on the east. Seen from a distance, these giraffe appeared, when adult, to be black and white, black with white bellies and limbs. Here and there monsters stood on the tops of large anthills or small hillocks, sentries posted to warn the feeding herds of the approach of the giraffe's only enemies, man and the lion. Yet so little had man harassed these creatures during recent years, since the plateau was divested of its human inhabitants, the Gwas 'Ngishu Masia, by civil wars, that these sentinels seemed to have taken little or no notice of their caravan. With the aid of Mr Doggett, he secured four specimens—two males and two females—for the British Museum.

THE CONGO FOREST.

After describing Bvsoga, the Baganda people, and the southern part of Unyoro, the lecturer said that he crossed the Semliki River opposite Fort Mbeni and travelled for three days in the dense Congo forest. He could fully endorse all that Stanley had said about the awesome nature of those appalling woods. He could only say that the whole of his expedition, as well as himself, longed to be out of them, although they were in search of the now well-known Okapi, and of other wonders, some of which were found and some of which still remained undiscovered. He employed his time in this forest by visiting the Pygmies at home and seeing their little settlements of tiny huts constructed of withies and leaves. He also encountered there those strange prognathous ape-like people who seemed to be a race of pariahs dwelling on the fringe of other tribes. He also ascertained that the real gorilla comes pretty near to the Semliki in its distribution. He had reason to believe that other remarkable discoveries of hitherto unknown mammals would be made besides that of the Okapi. As it was, in that forest they obtained skins of several other beasts new to science. He was accorded the kindest hospitality by the Belgian officials, and given every possible facility for visiting that portion of the Congo Free State. He found the natives everywhere on friendly terms with the Belgian authorities, and the excellent roads and well-built stations, together with abundant supplies of the comforts and necessaries of existence from Antwerp merchants, introduced a strange element of civilization into those otherwise trackless wilds. Sir Henry Stanley would indeed be amazed at the change which had taken place in parts of the forest which some 12 years ago were to him and his expedition more remote from civilization than the North Pole.

THE DISTRICT OF ANKOLE.

The south-western part of the Uganda Protectorate consisted of the district of Ankole. A portion of that noble country rose to heights of 8,000ft. and 9,000ft., and here reappeared the alpine vegetation of Ruwenzori, Elgon, and the Nandi plateau. Among these mountains were scattered almost innumerable crater-lakes, which provided landscapes of exquisite beauty. They nearly all contained fish. The scenery round these crater-lakes was so extravagantly beautiful

that he felt that, coupled with the fact that they were in a country possessing a very healthy climate and few inhabitants, they might some time become the seats of small European settlements. The northern part of Ankole was somewhat drier and less equatorial in climate. It had a more parched appearance, at any rate during the dry season, and it fell in altitude. Here and there was a certain amount of big game, including buffalo, rhinoceroses, and eland? The people of Ankole, as was well known, consisted of a race of sturdy negroes—the Ba iro—and an aristocracy of Ba-hima, who were, as Speke, their original discoverer, guessed at once, obviously descended from a Gala, Somali, or other Hamitic stock. As regarded features and complexion, one often saw men and women among the Ba-hima who were more like Egyptians than was the case with the Galas and the Somalis. But, strange to say, the hair of the head was much more woolly and negro-like than was the case with Galas and Somalis. He had seen some men and women so light in complexion that he actually thought they were some of Emin Pasha's refugee Egyptians, until it was proved to him that they had been born and bred in Ankole. These people, no doubt, were the origin of many of the legends of a white race dwelling in Equatorial Africa. Among other points they were remarkable for their domestic cattle, which had more or less straight backs, were of large size, and had enormous horns. On the whole, the breed agreed remarkably closely with the long-horned cattle depicted in the Egyptian frescoes, and he believed that this race was the stock from which the long-horned South African cattle were derived

THE RUWENZORI MOUNTAINS.

The lecturer concluded with an account of his exploration of the Ruwenzri range of snow mountains. He said that Ruwenzori was still the most mysterious and least known mountain in Africa, and it was certainly, of all African mountains of his acquaintance, that which was the most constantly cloud-covered. He was personally convinced that the highest point of Ruwenzori was not under 20,000ft. in altitude, and that it would, therefore, be found to attain the greatest altitude on the continent of Africa. When, after the most arduous climb he had ever experienced, he reached his highest point on the flanks of the snow range—14,800ft.—the mountain above him seemed a thing he had only begun to climb, and towered, so far as he could estimate, another 6,000ft. into the dark blue heavens. Permanent snow, however, lay as low as 13,000ft. To effect a complete and successful ascent of the highest points of Ruwenzori required as elaborate a preparation as the exploration of the Andes or the Himalayas. An enormous deal remained to be done in the exploration of this, the most important range of Africa.

Sir Harry Johnston illustrated his lecture with a large number of beautiful lantern-slides made from photographs taken by himself, and created considerable amusement by reproducing by means of the phonograph specimens of native singing. At the conclusion of the lecture.

Sir H M Stanley, Mr J E S Moore and Dr. Bowdler Sharpe addressed the meeting, which was brought to a conclusion by a vote of thanks to Sir H Johnston, proposed by the President, and heartily carried.—London *Times*, Nov. 12.

PRODUCE AND PLANTING.

"Mr William Mackenzie, Ceylon tea commissioern, was in Toronto a few days last week," says the *Canadian Grocer* of November 8. "After calling on the wholesale trade he was much impressed with the progress that was being made with Ceylon greens. He said they were making equally good progress in the United States."

In its comments on last week's tea sales, the *Produce Markets Review* says: "There is an improvement in the demand for Indian teas, and prices on the whole have shown a somewhat firmer tendency. A considerable quantity was again withdrawn from the public sales, as holders evidently were not disposed to accept the lower prices established last week. A large quantity of the withdrawals has, however, since been sold, and, in most cases, at an advance on the bids made at the auctions, the market closing with a stronger tendency. The lower qualities, although much dearer than in the early part of the year, are about equal in value to those of the past few seasons, and there appears to be every prospect that present prices will be well maintained. A shortage in the season's production is practically certain, the deficiency being generally placed at 10,000,000 lb. but as there was a large surplus stock on the arrival of the new crop, there is apparently no reason for any material rise in prices. The offerings of Ceylon teas have been somewhat heavier, but a better tone prevailed generally, and, with good competition, the fall of last week was fully recovered.—*H and C Mail*, Nov 22.

"SO LONG" TO OOLONG!

Mr A R Robertson, writing in the first number of the "Tea and Coffee Journal," published in New York, describes the progress made since 1893 in the sale of Indian and Ceylon Tea in the United States.

"Formerly," he says, "it was exceptional to go into a grocery store and be able to buy this tea; now every store keeps it. The jobber until a year or two past was satisfied to carry a few chests for mixing, but now it is necessary for his business to have a fair selection of grades and quantities to supply demand; in conjunction with bulk teas, many wholesale grocers and jobbers have their own lead package tea in pounds and halves, which meet steadily with increasing sales. Why is all this? Because the teas have *virtues and values*. There is something satisfying in a well brewed cup of Ceylon tea and it is making tea drinkers, although only one half the quantity of leaves is required, in comparison with Oolong and other China teas. Thus it is cheaper to consumers, and although the total consumption of tea does not increase greatly estimating by number of pounds imported, it goes so much further that it demonstrates clearly that more tea is being consumed."—*Tea.*

£5,000 REWARD.

FOR DESTROYING THE PRICKLY PEAR.

Brisbane, Nov 27.

The Government today decided to offer a reward of £5,000 for the discovery of a method of eradicating the prickly pear, subject to certain conditions, one of which is that the cost shall not exceed a fixed maximum sum per acre.—*Adelaide Observer.*

ESSENTIAL OILS FROM CEYLON. IN THE GERMAN MARKET.

(*From the Semi-Annual Report of Schimmel and Co., (Fritzsche Brothers,) Miltitz near Leipzig, October 1901.*)

Since the publication of our last report, important changes in the economic condition of Germany have been developing, changes which are casting their shadows ahead, and are making their influence fell ou the general state of affairs. In the front rank appear the new Customs Tariff and the Commercial Treaties with other countries. With regard to our own line, after exertions extending over several decades, the general desire to exempt the various seeds, such as anise, coriander, fennel and caraway, which are used in the manufacture, has at last been taken into consideration. It is proposed to admit these seeds in future free of duty for the distillation of essential oil, subject to an official permit and control. But in order to render this concession of real valne to our indnstry, it is necessary that the residues of the distillation should be left to the manufactnrer and not (as is the case with spices) that they should be required to be destroyed. These residues namely are dried, and form a valuable food for cattle. Successful competition with abroad is only possible if, in addition to the duty saved, these residues can be turned to accouut. On the other hand, it cannot be denied that the essential oil may only partly be abstracted from these seeds, and that the latter may be subsequently dried, with the view of using them dishonestly for mixing with normal qualities of seed.

For this reason it is necessary to grind or crush these seeds before the distillation ; they should, moreover, be completely exhausted in the distillation process, so that it may be possible to exempt them from duty when worked up into food for cattle. We have no doubt that the proposals made by us, which meet both cases, will be accepted, and that this contentious point may thereby be settled ouce for all. But, as nothing has been inserted in the draft Tariff without a *quid pro quo*, the import duty on the seeds mentioned above— iu so far as those seeds are not used for the preparation of essential oils — has been raised from 3 marks to 4 marks per 100 kilos, and that on essential oils from 20 marks to 30 marks per 100 kilos. The last-named increase is not only injurious to the German middleman, but has also the effect of raising the price of a large number of foreign essential oils which are indispensable for the home manufacture of perfumes and soaps.

CAMPHOR OIL.—An important change in this Japanese product is highly probable in the near future. The Japanese Government, encouraged by the results of the camphor monopoly, has given notice of its intention to stop the sale of camphor oil altogether, and to undertake itself the working up of the oil into its different constituents. It will soon be known whether the Japanese Government actually realizes the hoped-for profit, or whether it has not largely overestimated the consumption of safrol. In our opinion the working up of camphor oil, as an independent industry, can never be made to pay. In the two by-products "Desinsectol" and "Insectol" it may be possible to recognise two old friends, viz., light and heavy camphor oil. As, however, neither is soluble in water, the iuformation given above as to the dilution of the former with water needs scarcely be taken seriously.

CARDAMOM OIL.—The Ceylon cardamom oil mentioned in our price-lists is no longer made by us from the fruits of *Elatteria Cardamomum var. β*, but is now distilled from the seeds of another species from which the pericarp has been removed. As the seed is shipped from Ceylon under the name of 'cardamom seeds,' the designation 'Ceylon cardamom oil' is quite justified for this oil. It differs, however, from the oil previously supplied by us according to various determinations our present Ceylon cardamom oil has approximately the following constants ; specific gravity at 15°, 0.9336 ; optical rotation +24° 15' ; saponification number 109. The oil makes a clear solution with three parts by volume of 70 per cent alcohol.

CINNAMON OIL, CEYLON.—Since the date of our last report the price of fine cinnamon chips has undergone a further important reduction, and along with it also the quotation of the distillate, which we were the first to produce, now some 27 years ago. At that time the price of cinnamon chips was about 176 marks per 100 kilos ; now it is about 55 marks ; the imported oil cost then about 220 marks, whilst its present quotation is about 70 marks per kilo.

CITRONELLA OIL.—Contrary to all calculations the value of this leading article has gone back still further in the course of the last six months. It has now reached a level which would have been considered scarcely possible. This points to a considerable overproduction of this oil also, an over-production which it is impossible to stem by ordinary means, and it will therefore be necessary to wait until this unhealthy state corrects itself. It will be remembered that already several years ago, when the price was 1/- per lb., the Ceylon papers described the distillation as wholly unremunerative, and shortly before the publication of our April report we were informed from Galle, that in many districts in Ceylou the citronella cultivation had been entirely given up. If, in spite of this, the prices have declined about 20 per cent, this fact throws a very peculiar light on those statements.

The shipments from Colombo and Galle were as follows :—

				lb.
From 1st January to 1st July		1901	...	634,608
do	do	1900	..	605,644
do	do	1899	..	657,080
do	do	1898	..	616,784

The first-named amount is made up as follows :—

		lb.
United Kingdom	...	374,607
America ...	...	138,749
Australia ..	...	2,304
Germany ...	..	110,373
France ..	...	2,399
India ..	..	174
China aud Singapore	..	1,582
Austria ...	...	4,420
Total ..		634,608 lb.

A considerable increase is shown in the sale of the fine Java citronella oil, the quality of which has so far remained the same, aud which has a constantly increasing number of friends. Several large consumers who used to employ exclusively Ceylon oil, have gone over to the product from Java, and appear to find it worth while. For the better quality soaps only Java oil should be used, and the proportion be reduced by one half as compared with Ceylon oil.

SANDALWOOD OIL (EAST INDIAN)—The use of this oil, both in medicine and in perfumery, makes such rapid progress, that we found it necessary to make special arrangements in our new Works for the manufacture on a large scale, which arrangements have answered exceedingly well. The distillation process has not only been considerably shortened, but has also been so much improved from a technical point of view, that the product may now be said to have reached the highest pitch of perfection. The rumours about the monopoly, which were circulated in London early in the year and caused a great sensation, have not been confirmed, but, on the contrary, have been officially contradicted.

GERANIOL FROM CITRONELLA OIL.—(German Patent No. 76,435.) Since the completion of our new factories, the manufacture of this product has now entered upon another stage, and we hope in a short time to be at last able to keep it in stock. In view of the difficulties met with in the supply of palmarosa oil, geraniol will be called upon to play a more im-

portant part than hitherto, and we hope that the possibility of obtaining it now in sufficient quantities will stimulate new trials. Pure geraniol, such as supplied by us, is a magnificent body with an intense and pure rose odour.

SAFROL.—When reporting on camphor oil we already mentioned the changes which are imminent in the production of safrol. The Japanese Government is no longer willing to let us make the "large profits" which are said to have been made here, and it has erected at Kobe a safrol factory, which has been placed under the management of a Japanese chemist, Dr Shimoyama, who has made his studies in Germany. It is stated that in this factory in future the so-called brown camphor oil (in which we discovered safrol in 1885) will be worked up into safrol, and placed direct upon the market. This industry has already been carried on in Japan for several years by Americans, but does not seem to have prospered; as a matter of fact it has been limited to the production of an inferior product for the American market. The Japanese Government has now the intention of placing pure safrol on the market, and of monopolising the article. The future will show whether this project can be carried through.

VANILLIN.—Enormous competition has brought the price of this product to a level which nobody would have considered possible. For the price of one kilo of the finest vanilla, one can now obtain the same quantity of the 50 times stronger vanillin—a fact which calls for admiration. In this connection the question rises involuntarily, what the present value of vanilla would be without the competition of vanillin? Whether it is to the interest of the consumer to take the price as the only criterion, is a question which for this preparation we would decidedly answer in the negative, and we would point to the many possibilities of adulteration which have already made themselves felt in previous years. Benzoic acid and acetanilide have been special favourites for this purpose. (See our Reports of October 1894, p. 79 and October 1898, p. 64.)

CANADIAN TEA TROUBLES.

The following appears in the "New York Tea, Coffee, and Sugar Journal," which quotes the "Montreal Herald" as its authority:

"It will cost more to satisfy Canada's thirst during the next twelve months than it did during the year just past. This increase in expenditure for beverages will not be due to the fact that more alcoholic stuff is to be consumed—some people say that is never done to the limit—but because the price of tea has advanced and is still going up. The tea men all say when asked as to the condition of the tea market, 'Prices are firm.' This means teas have advanced from a cent and a half to two and a half cents a pound. An increase this look like a very small affair, but most men would find it very embarrassing to settle the increase for the whole of Canada. Last year the Dominion brewed twenty million pounds of tea. There will be as much consumed this year. Now an increase of two cents a pound in the price amounts to four hundred thousand dollars on a year's supply. General shortage in tea crops of India, Ceylon, Japan, and reductions in the production in China are the causes of the scarcity of tea, which will be more severely felt in London than elsewhere, as London is the greatest of tea towns. Half the crop of the world finds its way into the capital of England in the course of the year, and from there is distributed all over the world. In Japan this year shortage of a million pounds in the crop is anticipated. Prices have already advanced there. India and Ceylon are suffering from over-production. The plantations of these two countries were extended so rapidly during the last few years that they produced more tea than the world wanted. With cheap labour and favourable climate and soil, the planters were able to put a fine quality of green tea on the market so cheaply that China could not compete, and Chinese growers were driven from the market. This is shown by the export figures of Foo Chow, the port from which all the China greens come from. Last year 5,000,000 were sent from this port. So far this year, and the exporting season is almost over, 92,000 pounds only have been shipped. The Japanese teas are of higher quality, and were not affected to the same extent by the Indian and Ceylon invasion. The planters of these two countries, in spite of a splendid crop and the driving of China from the market, did not make money. So this year, before the planting period, they combined to curtail production. The area devoted to tea cultivation was materially reduced. Then the unexpected happened. This year's crop has been largely a failure. The reduced area given up to tea did not produce more than half a crop. Now the world's tea supply is away below what it should be. Montreal is the great tea town of Canada and conditions all over the country can be judged pretty well by those here. Last year tea was very cheap, and everyone loaded up at the beginning of the season with enough to last a year. This year, with prices up, the trade will probably buy in smaller quantities, and watch for a break in the market. The quality of tea sold is likely to be inferior. Canadians have fallen into the habit of buying teas at a special price. There are 25c teas, 30c, 40c and 50c, which are favourites with housekeepers, and they will not change their prices to accommodate any fluctuation in price in Japan. The wholesaler and the retailer are not going to sacrifice their profits, so a poorer quality of tea will be put up in the 25c, 30c, 40c and 50c packages this year. And everyone will be happy.—*H & C Mail*, Nov. 22.

INDIAN TEA ASSOCIATION'S MEMORIAL AGAINST THE CEYLON DUTY.

(No. 1246-0.—From the Secretary, Indian Tea Association, to the Secretary to the Government of India, Finance and Commerce Department.)

Royal Exchange Building, Calcutta, 23rd Nov. 1901.

Sir,—I am directed by the General Committee of the Indian Tea Association to invite the attention of the Government of India to certain matters relating to the duty levied upon teas imported into the island of Ceylon.

2. In the first place I am to state the facts concerning the duty. The most important fact is that it is a protective duty; for it is levied at a rate of 4 as. per pound on all imported teas of whatever origin. The consumption of tea in Ceylon is said to be comparatively speaking insignificant. It is unlikely therefore that the duty was imposed for the purpose of conserving the local market for the Ceylon planter. But in Colombo the blending of teas for exportation, forms a considerable trade; and it was no doubt with the view of preventing the admixture of low grade China growths with the produce of the island that prohibitive taxation was determined upon. It is, the General Committee think, only natural and right that Ceylon should have taken stringent measures in order to preserve the good reputation of its teas. But the duty has also the effect of practically excluding from the Colombo market all Indian teas which might otherwise be sold at the public auctions there. This exclusion does not closely concern the industry in Northern India; but it is of very great consequence to those Gardens which are situated in the Madras Presidency. The cultivation and manufacture of tea in Travancore and the neighbouring districts are assuming large proportions. The extensions of the planted area during recent years have been considerable; and the annual production now amounts to about five and a half, or six millions of pounds. But the planters labour under one great disadvantage: they are at present without an accessible market for their teas. Calcutta is too remote, and neither Bom-

bay nor Madras, nor any of the smaller ports on the south coast are, or are likely to become, centres of the tea trade. The only market within easy reach of the grower in Southern India is Colombo; and that market he is practically debarred from using by reason of the protective duty.

The hardships which this barrier entails have been forcibly represented to the General Committee by the United Planters' Association, and the other kindred Associations, of Southern India. It has been pointed out in these representations that under existing conditions Indian teas cannot be sold in Colombo on an equality with Ceylon teas. The reason for this is that, being dutiable, they are stored in the Bonded Warehouse, from which they cannot be removed except on payment of the duty (which is equal to about 70 per cent of their average value) or on their being shipped. This precludes their being used by dealers for blending purposes, and consequently has a distinctly adverse influence upon prices. The Ceylon planters are—as has been already conceded—doubtless right in taxing foreign teas, because they object to their own being mixed with inferior growths. But this objection does not apply to teas produced in Southern India, because these are equal in quality to ordinary Ceylon teas. For the protection of the latter, therefore, it is not really necessary to tax the former; and the Southern Indian Associations are very strongly of opinion that their produce should be admitted free into Ceylon.

4. As has been already stated the duty does not to the same extent affect the Northern Indian industry, which this Association more especially represents. But in one respect it indirectly exercises a prejudicial influence upon the distribution of teas produced in the northern districts. This is particularly so in the case of teas destined for the Black Sea ports, where a great prospective market is believed to exist. There is no direct steamer service between Calcutta and Russian ports, and consequently transhipment at Colombo or elsewhere is unavoidable. Moreover the Russian Government gives certain advantages in inland transit to goods landed from the steamers of the Russian Volunteer Fleet trading between China and the Black Sea. And in order to put Indian tea on equal terms with that from China and Ceylon, it is therefore necessary that these steamers should be carriers. It is almost needless to say that Colombo in view of its geographical position in relation to Calcutta is the natural point for transhipments But the charges which are levied there are so heavy—because the tea has either to be stored in the Bonded Warehouse or to be cleared by payment of the duty —that it is less expensive to tranship at Singapore, notwithstanding the greater distance. If Colombo were a free port such a detour would be unnecessary and much valuable time would be saved. In this respect therefore the existence of the duty is a distinct disadvantage to teas shipped from Calcutta.

5. It is the opinion of the General Committee—after having given the whole question their most attentive consideration—that the facts disclosed in the preceding paragraphs justify an application being made to Ceylon for the abolition of the duty, so far as Indian teas are concerned. They have consequently instructed me to enquire if the Government of India would be disposed to assist the Indian industry by preferring such a request to the Ceylon Government, or if need be to the Secretary of State for the Colonies. In making this enquiry the Committee have not omitted to take into account the possibility that the Colonial authorities if they consent to admit Indian teas free, may be willing to do so only on the condition that the 5 per cent. duty now levied in India is likewise remitted in the case of Ceylon teas. So far as Indian growers are concerned the Committee are unacquainted with any reason why such a demand, if made, should not be complied with. And seeing that the revenue derived from this source cannot be large, they presume that the Government of India would raise no serious objection; for any readjustment of taxation which might be required would apparently be trifling and easily arranged. The proposal which the Committee venture to advance is, therefore, of a two-fold nature. Firstly, that an attempt should be made to induce the Ceylon Government to exempt Indian tea from the payment of duty; and secondly that, if necessary, Ceylon tea should be likewise exempt from the payment of duty in India. In the case of non-British teas the Committee consider that the existing duties should be maintained.

6. It has been suggested that if the Ceylon Government definitely decline to make the concession asked for the Government of India should seriously consider the advisability of enhancing the Indian duty to a protective rate. That the present position as between India and Ceylon is unfair to the former is evident. For while Indian tea—as has been shown —is practically excluded from Colombo, Ceylon tea is being sent to India in increasing * quantities. The rate of duty is so low as to present no real obstacle to its importation, either for consumption in India or for re-exportation to Central Asia. The Indian tea industry have determined, as you are doubtless aware, to make a strong effort to extend the consumption of Indian tea in both the markets indicated, especially that of India itself. And it does not seem fair that Ceylon should enjoy the benefit of developments effected at the cost of India, while itself retaining a practical embargo on Indian tea. Statements have also been made to the effect that the quality of a large portion of the tea now being imported from Ceylon is so inferior as to necessitate a protective rate of duty. Upon this point the Committee are at present unable to express an opinion; but they are distinctly opposed to the continuance of the inequality as between the two tariffs. The removal of this inequality would, they think, be best effected by abolishing both the duties in question. But if the Ceylon Government are not agreeable to this being done, then the enhancement of the Indian tax would appear to be the only alternative.

7. In conclusion the General Committee respectfully venture to ask that this letter may be submitted to His Excellency the Viceroy for such orders as His Excellency may see fit to pass.

I have the honour to be, Sir, Your most obedient Servant, W. PARSONS, Secretary.

BRITISH NEW GUINEA UP-TO-DATE.

The report from British New Guinea for the year ended June 30th last shows that during the past ten years the revenue has more than quadrupled, while the expenditure has increased by about 50 per cent. In the last five years the trade has almost trebled. The rubber industry is at present languishing, probably because the accessible country near the coast is worked out. But there is an enormous area of good rubber country waiting to be worked in a scientific and rational way: "until and unless it is treated so, it had better be left alone, and it is infinitely preferable to see a diminished export than an apparently flourishing trade being carried on at the expense of its capital sources and ultimate ruin." The accounts of the visits of inspection to various parts

* The imports for the past five years are stated by the Director-General of Statistics to have been as follows:—

	lb.		lb.
1896-97	748,127	1899-1900	570,161
1897-98	1,059,716	1900-1901	1,496,700
1898-99	1,108,686		

of the colony are, as usual, very interesting. It is noted that considerable progress has been made in the spread of the authority of the Government everywhere. The year, however, has been unfortunate, as whooping-cough, which was introduced by two white children from Cooktown, has ravaged the country, with dire consequences to native life. The malady first spread rapidly along the coasts, and then into the interior. "But the mischief does not end there, for as each village is attacked, and as no death can, in the belief of the native, be the result of any natural cause, but must have been compassed by some unknown enemy, who can only be discovered by witchcraft, the sorcerer is at once consulted, and some unfortunate villager of some other tribe is designated as culprit, and a midnight massacre of innocent people is the result." A curious circumstance which is noticed is that a wide gulf generally exists between prisoners and free men in the native mind. Free natives will not work or camp with prisoners. Yet no stigma rests on the prisoner who has served out his sentence and is released. He is regarded as having purged his offence against the law. In civilized societies the stigma always remains, and "this is the real difference between the degree of intensity in the punishment of civilized and uncivilized men."—London *Times*, Nov. 22.

THE ORIGIN AND DISTRIBUTION OF THE COCONUT PALM

forms the subject of an interesting paper by Mr. O F Cook in a recent issue of the United States National Herbarium. It is contended that this most useful tree must have originated on the Pacific Coast of South America and spread from thence to Polynesia and Asia. It is pointed out that all the other species of cocos are natives of South America. The coconut palm was found upon the Pacific coast by early Spanish explorers. Mr. Cook also claims an American origin for the banana and yam.—*Nature*, Nov. 28.

THE NEW TEA FERMENT.

(*Specially communicated.*)

The original discovery of the oxidising plant enzymes is principally centered round the investigations of G. Bertrand who investigated the peculiar properties of Japanese Laquer and proved that their hardening property was caused by the action of an oxydase which he named laccase acting on the peculiar juice, of the plant Rhus vermicifera. The juice which is of the consistency of thick pale cream, remains unchanged when stored in well stoppered bottles, but almost immediately commences to turn brown and harden when exposed to the air. Here was a clear case of oxidization and it was proved that the juice had not the power of hardening in the absence of its enzyme, only a resinous soluble grease being obtained under such circumstances.

The above discovery gave an impetus to the enquiry into many domestic problems, amongst others as to why an apple turns brown when the rind is cut or broken and it is exposed to the atmosphere. L. Lindet in 1893 explained this discoloration as resulting from an enzyme to which was subsequently given the name of malasc. The rapid discoloration of the cut slices of beet in the sugar works even when they had not been in contact with iron or steel was traced to an enzyme which was named tyrosinase. C. Loew in America, when investigating the cause of the flavouring of tobacco for the U.S. Government, after deciding that it was not caused by bacteria, described first an enzyme, then a per-enzyme, and lastly a catalase as present in the leaves, all of which had the power of oxidising some constituents of the leaf, and it was entirely to their action that he attributed the different flavours of the tobacco. One named oleasc is also present in the olive which is the principal agent of its decomposition before being put in the press, it also passes into the oil expressed at a temperature below 70°C. and continues to carry oxygen thereto forming oleic acid, acetic acid, sabacic acid, &c. Mustard oil, as such, is not present in the seed, but is a product of an enzyme myrosin acting on a glucoside sinigrin, or potassium myronate, which is also present in the seed. In the presence of water the myrosin decomposes the potassium hydrate, splitting it into potassium hydrogen sulphate, sugar and allylthiocarbined (mustard oil). Flax castor oil and many other plants contain in the seed an enzyme called lepose. Care must be taken in experimenting with these enzymes as they are not all harmless compounds. In the Rosaceae is found an enzyme, emulsion, often associated with a glucoside amydalin, which it decomposes into benzaldehyde (oil of bitter almonds), sugar and the very poisonous prussic acid. The above are some of the well-known enzymes from the action of which, by analogy, we can to some extent trace that of the one found in tea. In almost all these cases oxygen is carried by the enzyme to the tannin and thus dark coloured oxy-compounds are produced which are precipitated in the cell walls as a fast permanent dye. While the cell remains intact the oxygen cannot obtain access to the enzyme or to the tannin, but as soon as the cell walls are ruptured oxygen gains access and the action commences at once.

A number of people have discovered different enzymes and have assigned to them different powers; but the broad fact remains that the majority of them have the power of oxidising lacoll, other palyotomic phenols, as also their acid derivates gallic—acid and tannin,—as well as the polyphenols contained in the group OH or NH_2, either in the ortho or in the pari position. The known enzymes all appear to belong to the proteid class of organic substances and a small quantity of each is enabled to transform a large bulk of the object on which it acts without increasing or very much diminishing in bulk. They are generally destroyed at a temperature of about 70°C., are very much more active in the dark, and are gradually destroyed by bright light. Now

TO TURN MORE DIRECTLY TO TEA,

an enzyme is present in the leaf, also a per-enzyme and a catalase, the former of which we may not inaptly call

thease. This enzyme, when isolated, has most if not all the above chemical reactions, beside probably a few others which up to the present time I have not fully investigated. Its function in the living plant is probably in conjunction with some plant acid to act on the tannin, which in this case is a glucoside, converting it into aldehydes and phenols which are absorbed in the nutriment of the plant. Isolated it converts tannic acid into glucose and during the fermentation or rather oxidation of the leaf it is the principal factor, as when extracted the leaf does not colour; its quantity seems to vary, the better the tea the more enzyme. The enzyme is probably in the sap of the tea plant and not in the cells in contact with the tannin, as, if small pieces of leaf and young stems be soaked for some days in an alcoholic solution of acetate of copper, then thin micrometer sections cut from them, after some of the copper is precipitated in the cells by the action of the tannin, and then the sections treated for one or two seconds with a weak solution of acetate of iron, and put under the microscope, it will be seen that almost every cell contains tannin; if now some Tinc. Guiac. and H_2O_2 be gently run in under the cover glass, the outside cells first turn a brilliant blue, and small globules of blue also occur in other parts of the leaf, leading to the fibro-vascular bundles. The latter part of the experiment is a very delicate one and the investigator must expect many failures, the whole section generally turning an intense blue obscuring every thing. If now we take sections of the root we have the enzyme in very much larger quantities than in the young shoots, and this is the first time that it has been noted in this position. It is also present in the seed, and seems to exert an oxidising influence on the tea oil when expressed cold, as under certain conditions I have detected a decided aroma, but up to the present I have not been able to spare sufficient time to investigate it. I have found that a large number of plants of the most diverse orders, in fact the majority that I have experimented with, contain in some one or other of their organs an enzyme. If it cannot be found elsewhere it is generally present in the roots, and it is from this source that I propose to procure suitable ones to aid and intensify the action of the enzyme already existing in the tea leaf, and for this I have applied for a patent in India and Ceylon. In some teas the enzyme is often deficient in quantity for the full oxidising effect to take place in the leaf; a proper enzyme added to the tea during the process of manufacture considerably improves the quality, and in all cases in which I have been able to try it there is an improvement in the tea.

This is, I believe, the first time that it has been proposed to make any practical use of an extracted enzyme, hence a considerable amount of experiment is required. The subject is a vast one if successful; it will have greater effect on the tobacco manufacture than on that of tea. In the tanning industry it shows how a large quantity of tannin can be lost through improper harvesting. Oak-bark, I have found, contains a considerable quantity of enzyme, also canaigre and the other docks, which is capable of rapidly converting tannin into glucose: hence probably some of the failures to transport canaigre roots from India to Europe.

C. R. NEWTON, F.R.M.S.

Kurseong, 24th Nov. 1901.

TEA IN BRAZIL.

BUT NO LABOUR TO PRODUCE IT.

We learn that a tea plantation of considerable extension exists near Ouro Preto which might easily, it is claimed, produce 2,000 kilos of different qualities of tea if skilled labour could be obtained. —*Brazilian Review*, Oct. 29.

TEA SPECIMENS WANTED AT BOURDEAUX.

AT A COLONIAL MUSEUM.

We are requested by our Paris correspondent to state to our readers that M. Pittard, "professeur adjount à la Faculté des Sciences de Bourdeaux, at present in charge of the Museum of the useful vegetable products of the colonies, would be greatly obliged for specimens of shoots of the tea plant with leaves, twigs with and without seed and flowers complete, sent as botanical specimens "without value." We are sure that many planters will be glad to advance the cause of science by complying with this request. The specimens should be simply pressed between sheets of blotting paper and packed between cardboard covers.—*Indian Gardening and Planting*, Dec. 5.

CALCUTTA OPINION ON THE GREEN TEA FACTORY IN COLOMBO.

THE METHOD APPROVED.

The news of Messrs. Finlay, Muir and Co's Green Tea Factory in Colombo, as announced in the *Ceylon Observer*, found its way to Calcutta quickly enough by telegraph, and *Indian Gardening and Planting* (Dec. 5th) has the following reference to it:—

We note from a telegram to a daily contemporary that Messrs. Finlay Muir and Co., are constructing a Green Tea Factory at Colombo, adjoining the Stores, which is now rapidly approaching completion. The size is 200 feet by 40. The leaf partially treated upcountry will be finished off here. This is the scheme which we urged on the attention of Indian tea men in our leader of 21st November ultimo. If our green teas are to have a good chance in America this method of working including all that is best in the Japanese system is most desirable. There is absolutely no bar to it as the leaf after the first rough treatment will keep in prime condition for a long time, and if contributions from various gardens are finished off in bulk we shall be able to offer those large homogeneous breaks which American buyers prefer. Green manufacture on the factory would be so simplified by the scheme that any manager with proper appliances to hand could work off surplus leaf at a time when free flushing had glutted the factory and here the advantage of a reduced amount of leaf to go through the elaborate processes of black tea manufacture would in nine cases out of ten result in a better tea being turned out at an enhanced price; which, together with the revenue derived from the green, show an actual profit on the whole transaction. We have indeed in green tea manufacture a means of obviating the losses sustained in excessive quantities of black tea, and looked at from this point of

view the movement is most desirable. Those who look upon green tea manufacture entirely by itself and gauge its returns without reference to its reaction on black, miss the crucial argument in its favour. We are not in a position at present to promise large profits on green per se, but the profit exists when the effect of a withdrawal of leaf from black tea manufacture and the convenience of reducing large rushes of leaf is considered.

PROGRESS IN UGANDA.

In October, 1900, and May of the present year (says the "Agricultural Journal") samples of India-rubber were obtained from the Maputa district of Zululand. The rubber was drawn from the Ibungu tree, a tree which grows all through the district. The samples were forwarded to the scientific and technical department of the Imperial Institute for analysis and report. Professor Wyndham R Dunstan, the director of the department, in the course of his reports, states that the samples were subjected to critical tests and are genuine rubber, but of varying quality. The samples were submitted to commercial experts in rubber for the purpose of determining their value The best was valued at 3s. 2d. per lb., and the worst at 1s. 11d. Whilst freely giving testimony to the good quality of the rubber, the reports draw attention to the large quantity of extraneost matter in the samples—bits of woods, &c.—which necessarily affected the commercial value of the rubber.—*Natal Mercury*, Nov. 25.

According to a letter which has just reached London, the material progress which is being made in far-off Uganda is extremely rapid. The Protectorate is now included in the postal union, and cart roads are being constructed to the Nile at Ripon Falls, and also to Lake Albert. The latter will, it is understood, be replaced at no distant date by a light railway. Two steamers, very much larger than the William Mackinnon, are to be run on the Victoria Nyanza, and a smaller one is to be placed on Lake Albert. Brick buildings for native chiefs and British officials are everywhere springing into existence, new plants are being introduced, and the rubber industry is being carefully fostered.

TEA PROSPECTS BAD.

An expert has reported unfavorably upon the prospects of tea growing in the Protectorate, but coffee appears to be more promising. Experiments in the cultivation of cocoa, oranges, pineapples, and other fruits are being made. Changes in the habits and customs of the Baganda are also taking place as a result of their association with Europeans; many of them now sit at table, and even recognise the use of knives and forks, whilst one of the leading chiefs has gone to the unheard-of length of permitting his wife to eat at table with him and to walk arm-in-arm with him down the public streets.—*Morning Leader*, Nov. 22.

MR. STANLEY GARDINER'S EXPEDITION TO THE MALDIVES. NARRATIVE AND ROUTE OF THE EXPEDITION.

[BY THE LEADER, MR GARDINER.]

At the end of March, 1899, I left England for Ceylon in the company of Mr L A Borradaile. On arrival at Colombo we found that the Board of Trade s. s. *Ceylon* had just left for Minikoi owing to a wreck on that atoll. This necessitated a delay of seven weeks, before we could hope to sail thither, a detention futher increased to eight weeks owing to stress of weather. Mr Borradaile accordingly proceeded to the Jaffna Peninsula, where he spent a month in familiarising himself with the life and conditions on coral reefs. I meantime prepared our stores, and made arrangements for the Maldive cruise, subsequently visiting the raised limestone hills and area of the north of Ceylon.* After returning to Colombo I traversed the entire coast between Negombo and Dondara Head, a distance of about 120 miles. Mr Borradaile joined me, and then settled down for a fortnight at Weligama—the Beligam of Prof. Haeckel—where there is a deep bay with reefs of small size across its entrance. The rich variety of animal life on the reefs both here and off the Jaffna coast as compared to the reefs of the Maldives and Minikoi is a most noticeable feature.

After a tedious week's detention in Colombo, we finally left Ceylon for Minikoi on June 17th, experiencing a very heavy north-west gale the whole way; in spite of this the sea one night was white with phosphorescence, a very unusual phenomenon in these waters. We located ourselves, and built a bungalow at a distance of about one-third of a mile from the south-west end of Minikoi island, under the shadow of the lighthouse, the boat belonging to which was through the kindness of Capt Channer, R N, freely placed at our disposal. The island here is about 470 yards across between tide marks, and a broad ride has been cut, giving the only open space of any size in the island. The vegetation is extremly dense, and forms a low jungle of *Pandaus*, *Hibiscus*, *Hernandea*, *Ricinus*, coconut and other trees, with *Pemphis acidula*, *Seaevola koenigii* and *Tournefortea argentea* on the shores. At the south-west end of the island is a shrine, the grave of a holy, Moslem sheik, connected by a good, shaded path with the village in the centre of the island. A small settlement formerly existed round the shrine, but it has long been abandoned, and the jungle near it is now far thicker and less trodden than elsewhere. The land has the same character up to the village, but further north it is much more open, and can indeed be traversed almost anywhere.† Our situation then was not unnaturally the best possible for the land fauna, on which the lighthouse lamp too had doubtless no inconsiderable influence. The open ride formed both by night and day our best collecting ground sugaring never meeting with any measure of success elsewhere.

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* Vide *Report Brit. Ass.* pp. 400—2, 1900.

† Owing to an old arrangement the produce half the island is deemed to belong to the Bebe of Cannanore. An arbitrary line of division exists near the village with gates and guards, who rigorously exact three-fifths of the cocoanuts gathered south of the fence. In this portion no timber of large size or old growth exists, the whole surface at one time having been cleared and planted. Subsequently on the hold of the Bebe becoming weakened or relaxed, vegetation was allowed again to assume its sway, resulting in the present dense, jungly growth. On the management of the Bebe's dominions being undertaken by the British Government, the old line of division as found was retained permanently with much injustice to the inhabitants, as it had been formely periodically open to revision. Since that time the north half of the island has been very rapidly washing away, while the south half has, if anything, been increasing somewhat in breadth. The north half cannot now annually support one-third of the present population, while the south has become a dense jungle, rapidly going to waste. It produces annually under the present system only a few hundred rupees' worth of coconuts, which the Government might well commute for a fixed annual charge.

For the marine observations and collecting, we had within a stone's throw of the house on the seaward face of the island a broad reed-flat, on which the sea continually breaks. Towards the north this gradually narrows, but westward broadens, and continues round the atoll. A broad boulder zone, which can be waded conveniently up to half-tide, extends the main (Minikoi) island inside the reef-flat to Wiringili and thence to Ragandi and round the atoll. These islets are merely rocky patches, the former with a few coconut trees, under the shade of which strangers are buried. Towards the lagoon there is a great sand-flat, exposed at spring tides from 100 to 200 yards from the beach. The situation was also chosen, as during the summer months the south-west monsoon blows, the effect of which I wish particularly to study. Unfortunately the monsoon of 1899 was very abnormal, the prevailing winds coming from west to west-north-west until the second week in August, when the proper monsoon commenced, bringing heavy rain in its train. The latter made work extremely difficult and unpleasant; the bottom could nowhere be seen on account of the surface disturbance; bottom living animals contracted, or retired into the sand or other shelters; the surface fauna sank to considerable depths.

The disadvantages of the position lay in the considerable distance of the house from the village and from the north passage into the lagoon, through which alone access to the open sea could be obtained in this monsoon. Natives had to be hired from the village for each several job, and it was too far for the children or fishermen to bring any strange animals they might find. The wind being dead in our teeth, and the numerous shoals making short tacks necessary, it was difficult to visit the northerly reefs of the atoll, and on no occasion was I enabled to approach them from seaward within about 200 yards.

During the month July and August a heavy easterly swell came up with large rollers, three times dying down and again regaining force. This swell was very abnormal at the time of year, and apparently was due to some cause completely outside the ordinary winds and currents. On enquiry I ascertained that it was also observed on the east coasts of Ceylon and India and on the large Ocean Liners proceeding from Ceylon to Albany. Subsequently I found that it had been felt throughout the whole of the Maldives; in Suvadiva and Addu it did considerable damage, sweeping over islets and land, which had never been affected before. The origin of the swell can only, I consider, have been due to submarine volcanic disturbances probably towards the East-Indian region.

During the first five weeks of our stay at Minikoi, while I was engaged in a survey of the land and shores, Mr Borradaile occupied himself mainly with a thorough study of the land Crustacea.‡ An incautious exposure of the reef, while collecting, then laid up with sunstroke, so that I had no option but to send him to Ceylon, whence he was ordered to return as soon as possible to England. For the remaining eight weeks I was absolutely alone, being deprived by illness even of my Singhalse servants.

I returned to Ceylon in the middle of September, Mr Forster Cooper shortly afterwards joining me from England. After some unavoidable delay we left Colombo on Oct. 18th for Male, the capital of the Maldives and residence of the Sultan. Owing to succession of accidents we did not arrive until Oct. 23rd, when we at once landed our stores, transferring sufficient for a three months' cruise to our schooner. The latter was lent to us by His Highness the Sultan; she was a vessel of about 16 tons, built in the island, of coconut wood, moderately seaworthy, but not laying within six points of the wind. The Sultan also appointed Hassan Divi Velanamanikofanu, his third vizier, to accompany us, and gave orders that every facility should be granted to us. After presenting our offerings to the Sultan and his viziers, we sailed from Male for Goifurfehendu (Horsburgh) atoll.

We at once had a house built on Goidu island, from which as centre we visited all the other land of the atoll and the greater part of the reef. A stay of altogether eleven days was made, and everything was unpacked and properly stowed on the schooner; the dredges and instruments were overhauled, and indeed all preparations were completed for the work in Mahlos and other atolls. The reef-animals were collected and preserved, being sent by native boat to Male to await our arrival. On leaving Minikoi I brought with me two boys, whom I had taught to collect in that atoll; these I largely employed in Goidu and subsequently in other islands in collecting the land fauna and flora.

The remainder of October, 1899, was spent in S. Mahlosmadula. This group of reefs really consists of three atolls, a small central one separated from larger on each side by narrow channels of over 100 fathoms in depth. The three lie on a shallow bank, which tapers to the north but has a broad base to the south-east. The plateau is studded all over with reefs, the outside ones forming a chain round the perimeters of the three parts. The reefs along the west side of the bank are for most part ring-shaped, small atolls (atollons or *faro*) with deeper water (the lagoon or *velu*) in the centre. On the east and south sides, however, are isolated islands with fringing reefs mostly from the boundaries. The general depth of the atolls is about 27 fathoms, most of the channels between the numerous encircling reefs having over 20 fathoms.

The weather during our stay in S Mahlos was extremely calm, our vessel indeed being towed by boats from island to island. This was singularly unfortunate, as usually strong winds may be depended upon in November. We had hoped to systematically dredge a large number of the deep channels between the reefs, that edge the atoll. As their general depth is about 25 fathoms, this was found to be impracticable, rowing boats not having sufficient weight to carry even the smallest dredges along a rough bottom at this depth. Accordingly would be confined ourselves to a traverse of the whole south of the atoll. Our first anchorage was off Turadu, an island situated on the rim of a somewhat ill-defined *faro* at the south-west corner of the bank. We visited every part of its reef and collected a few animals. The lagoon (*velu*) of the *faro* was dredged, yielding *Asymmetron* and *Ptychodera* from 20 fathoms. The island itself proved most interesting. Its rocky barrier of beach-sandstone had in 1896 been overlapped by the waves of a cyclone. These attacked the sand behind, eating deeply into the island, with the result that the beach-rock has been left in lines many yards from the shore. The natives have now erected breakwaters round a great part of the island—and also a new mosque—but in spite of these no trace of it is likely to be left in 20 or 30 years' time, unless some considerable change in the currents or reefs alters its conditions.

From Turadu we visited all the reefs to Mabaru, the most easterly point of the whole group, anchoring at Hitadu, Heddufuri, Mahrus and Duravantu. At Cumfinadu we found some large rocks, standing up in the lagoon well inside the boulder zone; *Bonellia* was living on the reef-flat, and *Ptychodera* was the most abundant form of life on the shores of the island.

We finally left for N. Mahlos on Nov. 29th, but meeting with strong currents to the west-south-west, we only fetched Kuderah-Heelu in the central atoll that evening. However we reached Fainu in N. Mahlos on the following day, and remained there at anchor three days, which were devoted to dredging and an examination of the islands of Fainu, Kenurus and Ingurahdu, and Berriam-furi faro. We then separated from Mr. Forster Cooper dredging with the schooner along the east side, and examining its islands and reefs. I meantime embarked in a small open boats for the western side, where the lagoon of the atcll is filled up with a perfect maze of small reefs and shoals,

‡ *Vide* Mr Borradaile's account in the same part of this publication.

I first visited five of the lagoon islands, and then, a strong north-east breeze setting in, worked up along the edge of the atoll, sailing from down to dusk, and anchoring at night to leeward of the nearest reef. I examined all the reefs and islands, and sounded the velu (lagoons) of all the faro (atollons) along the western rim, rejoining the schooner on Dec. 11 at the north of the atoll. Unhappily a series of collections, made by myself and my boys, to illustrate the populating of sand-banks by both animals and plants, was ruined by my capsizing our fishing boat near Cuuderudu.

On Dec. 12th, after taking in wood and water, we sailed for Miladumadulu, a similar bank to Mahlosmadulu but with relatively far fewer reefs and a less determinate rim. We anchored the same night at Guthirdu, and at daybreak made sail towards the east side of the atoll. Owing to a strong south-westerly set of the current we took two days in reaching Dureadu in the middle of the bank, a distance of seven miles. This is the island of a round faro, one mile in diameter; its lagoon has 19 fathoms of water, a depth which makes the faro peculiar among all its fellows in the Maldives. We landed the same night for firewood and water, but, none of the latter being obtainable, were compelled to sail at dawn. A strong north-east gale coming out, we stood up at the atoll and watered at Rymaggu, anchoring that night at Furnardu, a large island on the east edge of the atoll. The islands of this rim of Miladumadulu tend to be closely fringed by the reef on all sides, and to have a *kuli* (shallow lake, French *barachois)* in the centre, surrounded by mangroves, through which the sea has in some found access. While Mr. Forster Cooper dredged with the schooner down to Kendikolu, I visited ten of these islands in a fishing boat; two were very small, three had definite kuli or else mangrove swamps (Ekasdu, a large lake swarming with a species of *Leander*), and four were crescentic in shape, their kuli now open to the sea. Kendikelu is one of the largest islands in the Maldives, being two-and-a-half miles long by two-thirds of a mile in breadth. There are four kuli down the centre surrounded by mangroves, which abound in rails; on their surfaces we saw a few duck, while their waters, which are quite fresh, four to five feet deep, teem with small fish. However, as Ramazan, the Mahommedan fast month, was approaching, we had to hurry on, and only stayed two nights. We accordingly, on December 19th, dredged down to Landu, obtaining a large variety of sponges and Polyzoa with a quantity of red *Polytrema* and some nullipores, in addition to corals, of which the black *Dendrophyllia ramea* was very abundant in 12 to 20 fathoms off the reefs. We visited and dredged Ma and Eddu faro with three to four fathoms of water in their velu, obtaining a few Cephalochorda, and examined some of the central islands of the atoll. At Manadu we caught a single specimen of *Typhlos*, which is evidently very rare in the archipelago, since it has no native name.

Fadiffolu atoll was reached on December 23rd; it differs from the preceding in being a true atoll, having a well-defined, encircling reef, especially to the east, and an open lagoon with but few shoals. We first moved down the east side examining the reefs but then dredged across to Innawari. The natives although not actively hostile, were very unfriendly, so that on Christmas morning we sailed down to Naifaro. The winter rains now commenced and continued intermittently with heavy squalls from the north-east for a month, making navigation among reefs difficult. The schooner too was decidedly unpleasant as the whole of our cabin accommodation had to be utilised for storing our books, instruments and various collections. We remained at Naifaro four days restowing and repairing our vessel, as she had been somewhat strained in the recent heavy weather. The time was occupied in a survey of the neighbouring islands and reefs, and in throughly dredging some of the passages into the atoll.

The shores of all the islands at the north end of Fadiffolu I found abundantly strewn with the shells of *Spirula*. Enquiring of the natives as to its "fish," I was surprised to receive an accurate description of it. It appeared that the animals were extremely abundant in January of 1897 in the channel towards Miladumadulu. "They float on the surface, and may be picked up with the boat-bailer. They are never seen inside the atoll, but periodically occur in the north-east monsoon in the open sea. None were seen in 1898." I offered a reward of 50 rupees for the first specimen, but, although, eight or nine boats went out daily during my stay, I did not secure one. That the people of Naifaro and Innawari really know the animal is undoubted. Yet this is peculiar, to I did not find on close enquiry that it was known as the natives of any other part of the whole archipalago, though its shell occurs sparingly everywhere. The native name for the shell is *markanu taludandi*, the heron's key.

Leaving Naifaro we again dredged accross the atoll on a more southerly course, subsequently cruising along the eastern side, dredging and examining the islands and reefs. On Jan. 2nd, 1900, we set sail for Male atoll, anchoring off Helengeli the same afternoon. This atoll is intermediate in its charaoters between Mahlos and Fadiffolu; except at the south end it has practically no islands in the lagoon. There are evidently great changes in its topography since the original survey, two islands of the eastern edge at least resting on their own reefs, having disappeared. There seemed to be still greater alterations in respect to the shoals in the lagoon, but in our somewhat dependent position any real survey was impossible owing to constant interference from Male. We, however, saw some of the western reefs on our way to Goifurfehendu, and on our return journey to Male, which we reached on Jan. 5th, 1900, we dredged down as close as possible to the eastern reefs. Further Mr Forster Cooper in the middle of February made a most successful dredging cruise of eight days in the atoll, taking 34 hauls, to ascertain the character of the bottom in every position, and I at the same time visited most of the islands and reefs within five miles of Male.

Ramazan had now commenced, and dependent as we were entirely on Mohammedan boys, it would have been useless to continue our cruise. Our vessel too was in want of a thorough overhaul, the rigging being very bad. After a couple of days in Male, we had house erected on Hulule, the island of a neighbouring faro, and at once transferred to it sufficient stores for a stay of four or five weeks' duration.

Hulule island is about 1½ miles long by 800 yards broad; it is about 2 miles distant from Male. The greater part of its surface is covered with coconut trees, but a large patch along the western side has been allowed to revert to jungle. The principal trees are the banyan, candle-nut and *Calophyllum*, the branches of which abound in frugivorous bats. On account of the island's proximity to Male, where all foreign vessels for the group have to enter, many plants have been introduced. For few of the fruits thrive, but half-a-dozen brilliant flowers relieve the everlasting green. Sweet-smelling plants, jessamine, frangspanni, roses and various herbs, make the proximity of the mosque and village pleasantly fragrant. The western shores are fringed with *Pemphis acidula*, the white, perfumed flowers of which prove a great attraction to insects. As some of our boys delighted in this work, the land fauna and flora was exhaustively collected. As compared with Minikoi, we found the insect and spider faunas to be decidedly poor except in butterflies, although it may be deemed to be throughly representative of any rich island in the centre of the Maldives. A certain number of insects must have been introduced with the plants, but the successful acclimatisation of any considerable number of the latter only dates back to the eruption of Krakatao in 1883. Before this time pumice (*fengbo-ga*, the water-swimming stone) was not known in

the group. Its fertilising properties have now been discovered, and in many islands baskets of it are collected and strewn over the garden land. The capture of two specimens of snakes on pandanus trees at Hulule was of interest.

The whole faro is $4\frac{1}{2}$ miles long by $1\frac{1}{2}$ broad; its lagoonlet or velu, in the centre has a depth of 6 to 7 fathoms. The reef everywhere is awash at low tide, and, though differing greatly in its characters, quite well defined on the side towards the lagoon of the large atoll. Besides numerous rocks there are two islands respectively at the north and south ends, Farukolufuri and Hulule. During our stay every part of the faro was surveyed, and the fauna carefully collected for comparison with that of Minikoi atoll. *Asymmetron* was very abundant in certain places in and around the velu, and at least three species of Enteropneusts of two or three genera were found, each in its own characteristic environment. Two specimens of a remarkable *Thalassema*, 2 feet long when alive, were secured from the boulder zone, besides a number of specimens of similar species. The sand was remarkably rich in Actinians of any species, all of which withdrew into the shelter of the sand at every rain-squall. Mollusca were not numerous, but *Cryptoplax*, *Chiton*, and each of the three families of the Zygobranchiata were represented; autotomy of the foot seems to be a widespread phenomenon as several forms with the foot thus cut off were obtained

We returned to Male in the middle of February. Mr. Forster Cooper at once sailed for his dredging cruise in the atoll, while I remained to carry on a series of observations on the currents in the channels on each side of the island. During my whole stay I dispensed medical aid freely to the people. At this time there was in one district of Male an epidemic of Malaria, with which I was naturally much brought into contact. Mr Forster Cooper returned to find that I had caught the infection. I saw, however, our collections to date properly packed for England, and the schooner victualled and equipped. As complications set in and I was getting worse instead of better, Mr Forster Cooper on February 28th took advantage of the chance visit of a British India Steamship Co.'s steamer to place me in charge of Capt. Pigott, R.N.R.*, for Colombo. He himself determined to carry out his part of the projected work, and sailed from Male on March 3rd for the southern atolls

I cannot speak too highly of the pluck, determination and resource, shown by Mr Forster Cooper who had had no previous experience of the topics. He worked his native crew in a manner, which I have never seen excelled even in the Pacific, and took o less than 88 dredgings in five different atolls. owever, I append Mr Forster Cooper's report, hich may be allowed to speak for itself.

"On March 3rd, accompanied by Mahommed Didi as interpreter and representative of the Sultan, I crossed over to S Male, in which three days were spent. Gurahdu island and reef were visited, but neither land nor reef in the atoll appeared to exhibit any novel features. The group consisting of a series of almost isolated reefs, I dredged principally in the outer passages and in the centre to ascertain the differences in the bottom-fauna. The hauls in the centre was very unproductive, but in the channels a large quantity of the same sessile forms, as in the northern atolls, was brought up. Just inside the northern passage a coral, *Gonioporo stokesi*, was obtained; it forms round heads on thick stalks, covered b any epitheca, which is completely buried in the sand or mud.

"On March 6th we sailed on to Felidu atoll, where we visited Alimata and Tinadu islands alone, at night anchoring generally to the nearest reef. We remained eight days, but only took 18 hauls of the dredges owing to head winds, strong current across the atoll and dead calms. Indeed throughout the whole cruise the unfavourable winds and the poor sailing qualities of the schooner prevented us from surveying as much of the atolls and from taking as many dredgings, as I would have liked. We attempted for three successive days to get up the almost completely enclosed eastern horn of the atoll, but were unable to tack up more than half-way. The lagoon in it is open with few reefs or shoals, and has a general depth of 40 fathoms; its bottom is hard, covered with sand, and absolutely unproductive to the dredge. In the rest of the atoll weed and broken shells were found towards the centre of the lagoon and rubble in the channels. *Diaseris* is very common almost everywhere and its skeleton forms one of the chief constituents of the rubble.

"We fetched Mulaku atoll on March 14th, and remained six days, taking 17 dredgings. The atoll is remarkable for the boad, almost continuous reef; along its eastern side. There are a number of very narrow, shallow passages to tho north, but from Maduveri to Curaille a distance of 30 miles, the reef is continuous safe for a single passage opposite Mulaku island. All the islands lie on the seaward side of this reef; extending down its centro is a series of long, linear velu (small lagoons), which off Raimandu is double, two series lying parallel to one another and the edges of the reef. In dredging I ran two lines across the lagoon and then moved down along the eastern side. Among other forms we collected a large number of soft-bodied echinoids, a few black crinoids and some holothurians, with which were associated a number of Polychaeta, crabs, caribs and molluscs. All were of the same ground shades as their various Echinodermata, whose colour was, as it were, photographed upon them.

"Kolumadulu atoll was entered on March 21st, but no work could be done from the schooner owing to the calm weather until the 26th inst. I meantime took the small boat out, and made various scattered dredgings in the north-east corner of the atoll with but indifferent success, while I sent the collecting boys to Kolufuri to obtain the land fauna and flora. I did not personally visit any of the islands in this atoll nor Haldumati, which we next dredged, as they all appeared to me to present the same features as in the northern groups. I was also anxious, as these two atolls are almost completely encircled by reefs, to ascertain precisely the characters of the bottom in every part. I sailed finally right across the centre of Kolumadulu lagoon, taking 16 dredgings down to 45 fathoms and incidentally running the vessel ashore on a small reef, off which we warped her without any great difficulty. The centre was found to be covered with fine mud, on which a few Crustacea, molluscs and flat-fish of small size alone appeared to exist. We obtained also a larval form of *Fierasfer* out of a holothurian from 25 fathoms.

"In Haddamati atoll I took 16 dredgings in the centre and eastern part of the lagoon, where the bottom was mostly covered with fine mud. They were very unproductive owing doubtless to the all but continuous reef of the eastern side. Relatively little work could be accomplished, as the schooner was in a horribly dirty state with bilge, etc.; she also had been somewhat strined on the reef, and her bottom was thickly covered with barnacles and weed

"To summarise, the cruise yielded between March 3rd and April 8th 88 dredgings in every part of the lagoons of five different atolls. The hauls must have averaged at least one mile each, and hence 88 miles of the bottom was covered. The latter was found to bo of an almost uniform dead-level between the reefs and shoals. which arising precipitously, uniformly reach to within a few feet of the surface. It was to most remarkable that we did not meet with a single

* I cannot sufficiently express my indebtedness to this gentleman for all his kindness to me.

knoll of any sort jutting up to indeterminate depths.*"

After paying a second visit to the Jaffna district. I returned to the Maldives, having secured Sheikh Jeevunjee Noorbhai's steamer Ileafaee, Capt. Molony, for a short cruise. I took on board at Male Mohammed Didi, Chief Vizier and uncle to the Sultan, Mafekilgefaun, the religious head of the community, and Hassan Didi, third vizier, with their suites as well as a Said, descendant of the Prophet, who had a family in Addu. After discharging some of our Male cargo we steamed south down the deep central basin of the group, coasting S. Male and Kolumadulu atolls. We steamed into Haddumati atoll on April 8th, and relieved Mr. Forster Cooper, who joined us. After transferring the collections, instruments and nets, we sent the schooner back under the native mate to Male, and at once sailed on to Suvadiva atoll, which we entered by the north-east passage on the morning of the 9th. This atoll lies between the equator and lat. 1°N.; it is separated from the central group by the "One and a half Degree Channel," 55 miles in breadth. It has a well-defined rim with passages at intervals, and is about 34 miles long by a little less in breadth; its lagoon has a maximum depth of 50 fathoms. As Addu atoll was to be our turning point, we now spent only two days in Suvadiva, dredging and sounding along the east side of the lagoon. We anchored with banked fires for two nights at Nilandu and Gaddu, and I further, leaving the dredging to my companion; visited Wiligili and Kondai.

Addu is a small atoll, 10 miles long by 6 broad, lying about lat. 0°40'S. Its reef is perfect except for two small passages to the north and two larger ones to the south. The lagoon has a maximum depth of 36 fathoms; it is fairly open in the centre, but against the encircling reefs has a perfect maze of coral heads, arising from 7 to 10 fathoms. It is noticeable that the greater part of the circumference of the atoll is surrounded by land. The "Equatorial Channel," 48 miles across, separates Addu and Suvadiva. In its centre is the island of Fua Mulaku, said to have a deep kuli (lake) in its midst; it is two miles long by one broad, and has a fringing reef only. On our passage to Addu, and subsequently on our return journey, we tried to visit it, but the heavy sea made both anchoring and landing quite impossible. We remained at Addu until April 15, examining the reefs and islands, in both of which there have been great changes since Moresby's survey. We also checked the soundings on the chart, and took 14 hauls of the dredge in the lagoon and on the outer slopes. In one of the latter from 40 fathoms we obtained a large quantity of *Heliopora cœrulea* with almost colourless corallum. The vegetation of the islands was far more luxuriant than any we saw in other parts of the Maldives, but the land fauna was very scanty as compared with Hulule. The animal life of the encircling reefs seemed to be both poorer and less varied than to the north; the growth of fixed forms of life in the lagoon was, however, decidedly lavish.

Revisiting Suvadiva on our return journey, we dredged and sounded within the lagoon along the south and west sides, anchoring for three nights at Gaddu, Nadalle and Havara-Tinadu, beyond which I did not land anywhere. On April 19th we entered Kolumadulu, having in the morning coasted along the east of Haddumati. We dredged the passage, as we entered and dropped anchor at Buruni, at once going on shore.

On April 20 we ran a line of sounding across to S. Nilandu, an atoll somewhat similar to Male. We twice traversed the lagoon, anchoring that night at Rimbudu. Six dredgings were taken in 19 to 35 fathoms; they proved to be in their result the richest series that were obtained in the whole archipelago, although I do not think we found any forms of which we had not previously preserved specimens.

On April 21 we sounded the channel across to N. Nilandu atoll, which we crossed. We then ran a line of soundings to Wattaru atoll across the central basin, which has very generally been supposed to owe its origin to the lagoon of a much larger atoll, now completely lost. We further sounded the channel between Mulaku and Wattaru atolls, anchoring for the night off Rakidu in Felidu atoll. On April 22nd we sounded the channel between Felidu and Wattaru atolls, and then ran a second line across to the western chain, about 15 miles north of the first. We sounded the channel between N. Nilandu and Ari atolls, continuing northwards sounding at intervals to Mahiaddu in the latter atoll, where we dropped anchor. On April 23rd we made a straight course for Male, putting down our third line of soundings across the central basin. We ran our line out along the channel between N. and S. Male atolls, obtaining finally a depth of 1005 fathoms, two miles S. W. ½ W. of the S. Point of the reef of Hulule faro. That night we anchored off Male and, after taking our collections on board, bade good-bye to the Maldives on April 25, 1900.

The collections may be allowed to speak for themselves in the subsequent parts of this publication. A word is necessary as to the dredgings, of which 273 were recorded in the maldives. They were intended to ascertain the character of the bottom within the atolls as well as its fauna in every position, in which the physical conditions might vary. Naturally a considerable number were under these circumstances absolutely barren, but all served their purpose. Seven dredges were used, both rectangular and triangular, of Naples or Plymouth models, as well as an otter and three beam trawls of 3, 4½ and 6 feet. The latter were made to my own design, and adaptation of Prof. Agassiz' model; they were always thrown overboard, when we were at anchor, about one fathom of rope being allowed beyond the depth, if the bottom was fairly level. For sounding from the schooner and small boats, besides regular lead lines, we used loosely spun cod-fishing line, as recommended by Mr. J Y Buchanan. On the steamer we had an old Lucas deep-sea machine, which was lent us by the Admiralty, Mr. Lucas kindly providing about 3,000 fathoms of wire. Of leads we employed the Telegraphic Construction and Maintenance Company's snapper, and valved leads of the Admiralty pattern. Other apparatus and instruments will be referred to where necessary in the account of the work of the expedition. J. STANLEY GARDINER*.

[Note. The collections of plants have been presented to the Royal Botanical Gardens, Peradeniya, Ceylon. A full report on them will be shortly published in the "Journal of the Gardens" by Mr. J C Willis, the Director.—J. S. G.]

* It is scarcely necessary to point to the great importance of this fact, as bearing on the question of the formation of the atolls and reefs of the Maldives.

* This account has been checked by Mr. L A Borradaile and Mr Forster Cooper.

PEARLING IN TORRES STRAITS.

BY R. F. T.

The average person in the Southern States seems to comprehend very little about that portion of the Commonwealth known as Thursday Island, and to know next to nothing about the industry which gives employment to fully 3,000 coloured men and 300 or so of whites who make their home there.

People in Sydney have asked me, "How many pearls does a diver bring up in a day?" They imagine that the bottom of the ocean is strewn with pearls, and are quite surprised when told that pearls are only "perks," and that the pearl-fisher is quite content to gather up his tons of shell and chance to luck to once in a while get a pearl.

I was on Thursday Island last year (1900), and accepted the position of a clerk on one of the pearling schooners. I deemed it would be a splendid opportunity for studying the trade, and also would extend my knowledge of anthropology.

The fleet that I was to join was stationed about 50 miles out, and there happened to be a 15-ton lugger taking stores out to the schooner on which I was to work. I went on board, and in about two days' time we reached the schooner, and as soon as I set foot on board the captain said, "Pick up a knife, and my son will show you the way to open the shell to look for pearls." So I went and sat by a big heap of shell, and was soon busily engaged probing the knife in and looking under the shellfish for them.

There were coloured men all round me seated near little tubs, scrubbing the barnacles off the shell, and washing away any superfluous shellfish that adhered to the mother-o'-pearl.

The number of these tubs was about four or five, and seated round each one were four or five men scrubbing away and keeping their eyes on the skipper, who was here, there, and everywhere, and growling all the time. He seemed to confer mostly with his bos'un, a big Arab, who stood about 6 feet 4 in. in his stockings, or more correctly, the bare soles of his feet.

We were then, three whitemen, amongst, perhaps, one of the most motley mixtures ever seen. There were Japanese, Javanese, Filipinos, Arabs, Cingalese, Southsea islanders, Murray islanders, boys from Rotumah and New Guinea. We even had two Esquimaux. They were a trifle out of their latitude, were they not?

The tower of Babel seemed to be in the course of construction by the multitudinous varity of tongues that were spoken.

It was just on 12 o'clock, and the cook put his head out of the galley, and sang out "Chow, chow," and the island boys, accompanied by all the rest, rushed towards a dish of steaming hot beef and commenced to fill their plates up with beef and rice, and to dip their pints into a big bucket of the most horrible ration tea that one could imagine. This then seemed to be their bill of fare—salt horse, rice and tea. The knife was the only requisite to assist in the repast, for instead of using forks most of them shovelled the rice into their mouths with their hands. The top of the hatches served as a table.

Now some of these poor fellows could hardly eat the beef, as most of it was bad, and as there was nothing else on this sumptuous board they had to go to the ship's clerk (myself) and get tins of fish and jam, which were debited to their accounts at about twice the price that the same goods would have cost on Thursday Island. In fact, I have seen a sheep sold to one of these boys for £3, and a sucking-pig brought out about Christmas time was sold for two guineas. As most of the crew on these schooners get only 30s a month, and they are literally starved into slop-chesting about a shilling's worth of goods everyday, they very often leave when their time is up, say after two years of service, without any money to draw at all, and are very often in debt a pound or two to the master of the vessel.

In the afternoon the ship set sail, and the crew, including myself, left our shell clipping and cleaning and engaged ourselves in sailing her. The captain came out with his telescope, and looking all round the horizon at last spotted a lugger that had been absent for about a week, and wishing to collect her shell accordingly set sail after her. On the way towards this boat we must have passed about 20 or 30 other luggers, some of them belonging to our fleet, and others working on their own account. One of these boats, a lugger belonging to our fleet, hailed us, and we luffed up to see what she wanted. The diver on the lugger, a Jap, called out, "Me got sick man; you take him back along a schooner." Our captain replied, "You make the animal work; he's only shamming." The Jap retorted, "No fear, him been sick two tree day." "All right, send him to the schooner." So the sick man, who was evidently suffering from a bad attack of sea sickness—he was vomiting terribly—was conveyed in the lugger's dingy to the schooner. When the dingy came alongside the captain caught him by the scruff of the neck and hauled him over the ships's side. He called out to the bos'un, "Come here, bos'un, and make this man well;" and the Arab commenced throwing a bucket over the drawing water, and whilst the captain held the poor shrieking wretch he poured bucket after bucket of water over him, and when he had drawn about 20 buckets the next part of the cure started, which consisted in kicking this Manila man round the deck three or four times, the captain swearing of the bos'un for not kicking him hard enough.

It was a pretty sight to see all the luggers at work. We passed hundreds of them, and divers were seen in all sorts of dress and undress. The divers work as scientifically as possible, and some of them handle boats with a command that is simply astounding. The boats are placed bows to the wind, so that they will not drift too much; although, of course, the boat is continually drifting, and the diver walks many miles on the ocean floor in his search for shell. Probably, in very much worked ground, he may walk a mile without getting a single shell. A diver told me that in one part where he was working the muddy bottom below was just like a ploughed field, the boot-marks of previous shell-seekers giving it that appearance. The diver also walks against the tide, otherwise the mud stirred up would make it impossible for him to see shell. Perhaps he sees a school of whitefish. As these fish are the heralds of sharks, he gives the signal to be pulled up, or as he would probably tell you, 'I see shark, I fright, I give single to be pull up.' Now I have not, among all the coloured men I have met on Thursday Island, heard one who could pronounce the word signal properly—they say 'single' to a man.

One of the most amusing things to be seen down below, a diver will tell you, is the 'monkey fish.' These fish have enormous eyes, and in many respects resemble monkeys. They make hideous faces at the diver, and are very hard to catch, diving in among the weeds and mud when he tries to get hold of them.

Divers work on contract, getting from £15 to £25 per ton for their shell. It takes them, however, a long while now to get a ton, as the grounds are so constantly worked. There was a time when a diver need only work for a month or two and he would bring back to the island enough pearlshell to keep him in food and champagne for the rest of the year. Those were the days when whisky was not sold by the bottle, but if a man wanted any he would have to buy the case full. Now it is merely a miserable existence, and a man may perhaps clear one hundred pounds in the whole year, but then look at the wear and tear on his constitution to do so! He rises at 5 in the morning, has a hasty cup of coffee, puts on his diving dress, and takes his first plunge, remaining under the water until breakfast time; after breakfast he is down again, walking miles on the bottom of the ocean until mid-day; after about an hour's rest he is at it again, and works until as late as the light permits.

Fancy working 12 hours a day at such an unhealthy employment, and for the remuneration of about £2 a week and rations of the vilest kind! There is not a white diver now in all the fleets. They have cleared out long ago, as they were convinced there was not a living in it.

Of course in the deeper water, say, for instance 30 fathoms, a man cannot possibly stay under all day, the maximum time being about five minutes, as the pressure of the water is so great that he cannot remain under any longer. Some of the divers through greed often lose their lives. The tender—the man who looks after the life-line—sends down the signal that the five minutes is up, but perhaps the diver just at the moment he gets the signal to ascend espies a nice patch of shell and tries to get it into his bag,

One, two, three minutes pass, then he frantically pulls at the life-line as a signal to be drawn up; but too late! They pull him up, and what was but a few minutes before a healthy, living man is an inert paralysed mass. The Japanese seem to be the most reckless in this respect; probably it is on account of their greed and eagerness to make money quickly but more than likely it is because, being fatalists, they regard death as a mere nothing, and as soon as one man is brought up dead in the dress another is eager and willing to put it on, and take his chance as a diver. They tell you that 'There are plenty more Japanese in Japan,' and if one dies it does not matter so very much.

About a month after I had been on board, in which time I had acquired a fair knowledge of Malayo, and a smattering of Spanish—picked up from the Filipinos—and was well on the way to becoming a fair seaman, a lugger came out from Thursday Island with the captain's wife on board. She, I learned, often used to make these trips, spending sometimes three or four weeks on board, and could steer and give orders for the sailing of the vessel after the manner of the skipper himself; but one day her nautical knowledge received a great shock. It was beautifully calm, and she was whistling, as is the wont of sailors, for the wind to spring up. She was gazing over the starboard side, when suddenly she espied a a great green turtle floating along asleep on top of the water.

'Oh, Captain,' she called out to her husband, who was in the cuddy, 'throw a tow-line over; there is such a big turtle out there.'

'Get some salt,' said the captain to a nigger who was standing by, 'and jump over and put some on that turtle's tails.'

Two of the coloured men jumped over and caught the turtle, but did not need any salt. The augh, however, was very much against the skipper's wife when in due course the yarn got round Thursday Island that she had tried to catch turtle with a hook; and so I have heard lately the mere mention of "turtle" one her enemy for life.

We used to fare pretty well out on the water owing principally to having a splendid cook. This man could make fine bread, beautifully light and well cooked. He made his own yeast out of rice and salt water. The "Bombay curry" that he served up was a savoury thing, and contained besides apples and coconuts about 20 different ingredints. Then there were "beche-de-mer" soup and all kinds of fish as our crew were always catching hundreds of them.

In those tropical waters aquatic snakes are very numerous. They are great flabby things mostly about 9ft or 10ft in lenght, and when they are captured and placed on the deck of a ship they wriggle about, but cannot move an inch ahead. They appear to be adapted for water for water only.

I had a slight attack of fever, which I must have contracted on one of the mangrove islands, at which wewere in tho habit of landing; and feeling life getting monotonus I resolved to return to my native State—New South Wales.

If the Alien Restriction Act does force the majorityof the pearlers to relinquish their business, it will be a very good thing, as these beds are now nearly tota lly worked out, and cessation of work for at least five or six years is required. By this time the young shell will have grown a good size and there probably will be enough of it to induce while men to dive for shell once more.—*Sydney Mail*, Nov. 23.

NATAL RUBBER,

(To the Editor "Natal Mercury.")

SIR,—Respecting the paragraph from the *Agricultural Journal*, regarding Professor Dunstan experiments with rubber grown in Zululand, I think the professor must be sadly mistaken regarding its value. At the present time Para rubber is selling at 4s and 4s 1d. per lb. It is a well known fact that Para rubber is worth twice as much per lb as any African rubber. In 1895 and 1896 I had Natal rubber offered me repeatedly at 1s 8d per lb, but I always thought it too dear at the price. I remember Para rubber going up to 4s 9d per lb just before the Baring Bank failure; and at that time there was some splendid Madagascar rubber on the market, for which they were asking 3s per lb, but it would not sell at the figure, although it is the cleanest and strongest rubber next to Para. I have bought flake rubber as low as 6d per lb. I do not know any African rubber which does not lose from 25 to 30 per cent in washing and masticating. I have known Mozambique rubber to lose 60 per cent in washing and masticating, and all African rubbers lose from 25 to 60 per cent. I was never asked above 2s per lb, either in London or Liverpool, for Congo Ball, and it is one of the cleanest and strongest African rubbers known. Let him (the Professor) send a sample to Moseley's, of Manchester, or Maclellan's, of Glasgow, or W Warner, Tottenham, and they will give its proper market value. Rubber-growing ought to pay in Natal, if kept clean, and not too much sand is put in.—I am, &c.,

JAMES GREGSON.

P.S.—I simply write so that people may not be disappointed if they invest their money in collecting rubber, and then get half the price they expected. African rubbers run from 1s to 2s per lb, both in London and Liverpool, according to quality.—*Natal Mercury*, Nov. 28.

PLANTING NOTES.

ASSAM TEA RETAILED IN CALCUTTA.—It is a healthy sign of the times to find energetic tea planters turning their attention to the retail sale of their product. The latest recruit in this line is Mr D H P Madden Manager of the Singlijan Tea Estate, Lahoal, Assam, who has opened a depôt at Calcutta for the retail sale of Assam tea. —*Indian Gardening and Planting*, Dec. 5.

ANTI-MOSQUITO WORK AND THE HEALTHINESS OF SIERRA LEONE.—The Governor of Sierra Leone Sir Charles King Harman has stated in a letter which he has written to Major Ross of the Liverpool School of Tropical Medicine that out of four hundred public servants, only three were on the sick list towards the end of October, and those were not suffering from malarial disease. The Nursing Home was empty. His Excellency added that he had inspected the work which was being done by the Liverpool expedition under Dr Taylor in draining and clearing up the town, and was surprised at the improvement Dr Taylor had effected. The population are much interested in this anti-mosquito work, and have the intelligence to understand the good that is being done for them by the united forces of the Liverpool School and of the Government of Sierra Leone. The figures quoted suggest that the sick rate in Sierra Leone has fallen below 1 per cent. This, if it last, will be phenomenal. Even in India the sick rate amongst European troops is about 10 per cent, and among native troops about 3 per cent.—*Reuter*, Nov 20.

Correspondence.

To the Editor.

AN "AD VALOREM" DUTY FOR TEA IN THE UNITED KINGDOM.

MR. C. SHAND'S VIEWS AND LETTER TO SIR MICHAEL HICKS-BEACH.

Kensington, Nov. 15.

DEAR SIR,—I enclose copy of a letter I have written to the Chancellor of the Exchequer. It will not please high country planters. I have read the Ceylon Chamber of Commerce's correspondence on the subject of the Commonwealth's proposal to lay an *ad valorem* duty on tea. It has not induced me to change my opinions. I have always thought that what is sauce for the goose is sauce for the gander. If an *ad valorem* duty in Australia would be a premium or bounty on the importation of cheap China tea, would it not be the same on cheap Indian and Ceylon tea? The memory of the Chamber of Commerce appears to be very short! They seem to have forgotten the history of the Tea Trade during the past 10 or 15 years; they also ignore circumstances passing under their own noses. I have noticed that upwards of 300,000 pounds of Ceylon tea, have been shipped to Hankow, in the centre of the Chinese Empire! What that tea would cost by the time it arrived there, you probably can calculate. No doubt it was used to make Brick tea; but it appears that if China wanted cheap tea, she has to go to Ceylon for it. Does this show that there is in China large stocks of cheap tea to send to Australia? The incident appears to me to be a hobgoblin set up to frighten His Excellency the Governor into action in what does not concern him. There is no use in hiding any longer the fact that the interests of high and low country planters are not identical. The former, who are the minority, have ruled the roost too long. They only pay 25 per cent of the Cess, the lowcountry planters paying 75 per cent. No wonder they propose to double the Cess, to fritter it away, in unpracticable schemes. They will doubtless console themselves, when they read my letter, with the reflection, that the Chancellor of Exchequer is not likely to pay any attention, to the representation of a single private individual.—yours truly,

C. SHAND.

I see by today's newspapers that the Commonwealth has decided to impose a fixed duty of 3d per pound. I wonder if the Chamber of Commerce would have protested, if tea had been admitted free. Logically they should have done so—a high rateable duty is experienced of high priced tea. Thus 6d per pound is equal to 100 per cent on common tea selling on an average at 6d, whilst on 10-penny tea it is only about 60 per cent, thus the consumers of cheap tea are unfairly taxed.—C.S.

52, Longridge Road, November, 1901.

SIR,—As the period is approaching when the programme of the National Ways and Means will be under your consideration, I have again the honour of soliciting your attention to the question of the Import Duty on Tea, which falls so inequitably on the cheap descriptions, which are chiefly consumed by the bread-winning classes. In the event of the War in South Africa being prolonged, and the exigencies of the Public Service precluding the possibility of your reducing the Duty, however desirous you may be of doing so, I venture to suggest that the injustice of its incidence would be redressed by your substituting an equivalent *ad valorem* duty in the place of the present rateable one. As the principle of *ad valorem* duties is, as I think you will admit, the basis of all equitable taxation, whenever it can be applied, and is the one adopted in nearly every civilised country when it is desired to make those articles of imported and exported merchandise, which vary greatly in quality and value, contribute to Revenue. There is, I think, nothing unreasonable in my suggestion, especially as there would be neither difficulty nor trouble in assessing the value and levying the duty. You are aware that practically all the Tea imported into the United Kingdom is sold by the Importers (chiefly by auction in bond, and that the duty is paid by the buyers when they wish to take delivery of their purchases. In their entries at the the Custom House the buyers would assess the value at the prices they paid for the Tea, and calculate the duty to which it was liable. The Custom House clerks would check the valuation by simply inspecting the duty-payers' "bought-notes" or contracts. Thus little more trouble is involved in levying an *ad valorem* duty than in collecting the rateable one. I invite you kindly to compare the facility and simplicity of this method with the trouble entailed in levying the duty on Sugar, Tobacco, Spirits, and other dutiable goods. The adoption of the suggestion will be doubtlessly opposed by all those who believe that expediency and not justice is the predominant principle that directs your actions.—I have the honour to be, sir, your obedient servant,

C. SHAND.

The Right Hon. the Chancellor of the Exchequer.

COCONUT PALM WITH 27 BRANCHES.

Hanwella, 15th Nov.

Dear Sir,—With reference to your para *re* "coconut trees with branches" in your paper of the 8th instant, I have much pleasure to inform you that I have seen a palm with several branches on it. I counted up twenty-seven branches but there were some more—some of them had nuts, like the parent palm, which looked very vigorous and sound, having a nursery of palms on its crown as it were. The branches were flimsy and a great many had withered away. The palm I am alluding to was at Negombo, in a garden near the lake. I happened to pass by it in 1870, in a boat, when my attention was drawn to it by the boatmen. I am not aware whether the palm is still alive or not.—I am, yours faithfully,

AN EYE WITNESS.

JAPAN TEA: RECORD LOW EXPORT.

Kandy, Nov. 27.

SIR,—I herein enclose extract from the New York *Journal of Commerce* for the information of those interested.—Yours, etc., A PHILIP, Secretary, Thirty Committee.

(Enclosure.)

Mail advices received from Smith, Baker & Co., dated Yokohama, October 3rd, say: Since about the middle of August the current prices of tea in Japan have been below the cost of production, and but little tea has been picked meantime. The available stock has dwindled to a small supply, and will soon be worth more for home consumption than for export. With this issue we are approaching the close of the buying season more near enough to predict with a fair measure of occuracy what the total export of Japan teas will be as compared with last year, and we believe the shortage will approximate one and three-fourths millions pounds, in other words, that the total export will not exceed thirty-six million pounds. So small an export has not been recorded in fifteen years. The reason of this is becoming more apparent and clear with each season's declining export. The cost of production in Japan has steadily increased from year to year for the last decade, and the value of tea in America and Canada at points of distribution has not advanced in like ratio. Consequently the tea industry in Japan does not pay is well as in former years, nor as well as other industries to which labour and land in Japan can be pplied. Yokohama—Arrivals, 190,634; settlements, 185,054; stock, 5,580. Hiogo—Arrivals, 90,823; settlements, 89,303; stock, 1,520. Arrivals at both ports, 281,457 piculs, against 298,312 do. same time last year, nd 330,153 piculs in 1899. Settlements at both sports 274,357 piculs, against 294,507 do. same time last year nd 321,716 do. in 1899.

ON THE USE OF ACETYLENE GAS LAMPS IN TRAPPING INSECT PESTS.

Peradeniya, Dec. 2.

DEAR SIR,—Some interesting experiments in trapping insects by means of Acetylene gas lamps have recently been conducted by Messrs. G Gastine and V Vermorel, in France. They have published the results of their work in a small pamphlet, of which the following is a resumé :—

For several years the vineyards in the Beaujolais have been infested by a destructive Pyralid moth. Many vine-growers had tried without success to check the pest. The authors of the paper attempted its destruction on the vineyard of Liergues, in July last, by means of illuminated traps. The lamps used were served with Acetylene Gas: the burner, with a naked flame, being fixed in the centre of a metal basin with a diameter of about 18 inches. This was partly filled with water covered with a film of petroleum: the burner projecting a few inches above the level of the water. The small generator was charged with 150 grammes (about 4¾ oz.) of Calcium Carbide, which quantity kept the light in action for six or seven hours: the flame being of a little over one "carcel."* The generator supported the basin and was fixed on a post at a convenient height. The lamps were lighted between 8-30 and 9 p.m., and burned ill day break. During the dusk it was found that ew moths were captured. The big catches commenced after dark, when clouds of the moths were fetedattra by the brilliant light. Some were singed by the flame itself, but the greater number precipitated themselves directly into the basins. When the insects are very numerous, a greater proportion of oil should be used to ensure their capture. The trials commenced on the night of 13th—14th July, with two lamps. One basin was accidentally overturned: the other captured 4,650 of the moths, besides an assortment of other insects. On another night as many as twenty lamps were employed, a total of 64,000 moths being accounted for, giving an average of 3,200 for each lamp. The biggest catch in a single basin was 5,000. From the 13th to 31st July, 170,000 of the moths had been destroyed in this manner. The average proportion of the sexes was 42 per cent females and 58 per cent males."

It is evident that such wholesale destruction of the moths must have a marked effect in checking the pest. This method of catching noxious insects deserves a thorough trial in Ceylon. It would be parti cularly applicable in such cases as "Tortrix"[1], "Nettle-Grubs"[2], Red-slug"[3], and other pests due to the caterpillars of moths. Whether it would be equally effective against helopeltis, "Shot-hole Borer," and other miscellaneous pests, can only be proved by separate experiment in each case. I have tried small oil lamps, without result upon either helopeltis or shot hole borer. But insects that take no notice of a small light, may be readily attracted by a more powerful one. A special apparatus, with which I hope to conduct experiments against our various winged insect pests, is now being constructed for me.

E. ERNEST GREEN.

GOVT. ENTOMOLOGIST.

THE NEW PROCESS FOR FERMENTING TEA.

FURTHER INFORMATION ON THE ISOLATED ENZYME.

FROM THE DISCOVERER, MR. NEWTON.

Kurseong, Nov. 22.

SIR,—It was with great pleasure that I read Mr. Bamber's criticism on my proposed new process of fermenting tea. I have always looked up to him as the greatest authority on the chemistry of tea manufacture, and his difficulty in finding and isolating the tea enzyme in Ceylon goes far to corroborate my contention, that the better the quality of the tea the more enzyme it contains, as in the best class Darjeeling teas it is easily demonstrable and there is no difficulty about isolating it.

Mr. Bamber has evidently had very little experience with plant enzymes or he would not say they increase in quantity after plucking, it being one of their peculiarities that they neither increase nor diminish in quantity, when separated from their original source, although they have the power of oxidising quantities of the product to which they are adapted.

In the Chemistry and Agriculture of Tea by Mr. Bamber, he says that the essential oil is considerably increased in quantity

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* "Carcel" is the French unit of artificial illumination, and is equal to the light emitted by a standard lamp with a flame 40 mm. high and burning 42 grammes of colza oil an hour.

1. *Capua coffearia*, Nietner.
2. *Thosea cana*, Wlk.: *T. recta*, Hmpsn.: *Natada nararia* Moore, &c.
3. *Heterusia cingala*, Moore.

during the process of manufacture. This hardly agrees with his present statement, but this is immaterial, my contention being that during the process of oxidation certain ethereal flavouring substances are formed which give flavour and aroma to the tea, and that by the addition of a proper enzyme more of the cell contents are rendered soluble, thereby increasing flavour and strength. Undoubtedly if a large excess of enzyme is added, or it is allowed to act for too long a time, there will be a loss of delicate flavour through the over-oxidation and rendering insoluble these delicate flavouring materials, the same as there would be by over-fermentation, but the one can be guarded against as easily as the other.

By the addition of the enzyme to most teas, the infusion is considerably improve in body and colour, by the larger quantity of the cell contents rendered soluble, and it remains to be seen whether with all teas an improvement in the flavour takes place, I sincerely hope that for the sake of the tea industry it does not, as that would mean a levelling-up of all qualities.

I have known of the oxidising enzyme in the tea for a considerable time, but have always hitherto thought it inadvisable to try to introduce chemistry into tea manufacture, in case we might reduce the industry to a level with that of Indigo. But now that the Japanese and the Ceylon and Indian Tea Planters' Associations have taken the matter up, it behoves all of us to do our best.

Unfortunately our tea season up here is over for this year, so I am precluded from continuing my experiments in manufacture and am reduced to those of the laboratory.

The enzyme can be demonstrated in the tea leaf by crushing a leaf, and then adding a few drops of tincture Guiac, when a blue colour will appear. It may be necessary in some cases to add a few drops of Peroxide of Hydrogen, to intensify the re-action or, in extreme cases, when there is deficiency of enzyme and an excess of tanning, to dissolve out some of the latter first with alcohol. If the chemically pure article is required it can be dissolved out of the tea with water, the tannin absorbed with gelatin, and the enzyme precipitated by adding five volumes of alcohol.—Yours faithfully, C. R. NEWTON.

PLANTING NOTES.

FIJI UP-TO-DATE: USEFUL INFORMATION FOR PLANTERS.—*Apropos* a correspondent's request for further information with regard to Fiji, we have pleasure in publishing a few para-graphs from "the Statesman's Year Book" for 1901, which may be of interest to him and other readers:—

For the purposes of native government the colony is divided into 17 provinces, in 11 of which a superior native chief exercises, under the title of Roko Tui of his province, a form of rule which recognises to a large degree the customs and the system of administration by which the people governed themselves prior to the establishment amongst them of a European form of government. In six of the provinces there are European officers as commissioners. About 175 native chiefs of inferior degree are employed by the Crown in subordinate administrative capacities, and receive salaries from the Government. There are also 35 native stipendiary magistrates associated with 10 European magistrates in the administration of justice. A European commissioner resides in Rotumah.

With regard to religion we learn on the same authority, that the number of persons attending worship in the native churches of the Wesleyan Mission in 1899 was 94,032 and attending the churches of the Roman Catholic Mission, 9,195. Two public schools receive state aid to the extent of about £750 a year, one in Suva and one in Levuka. During 1899 the Wesleyan Mission had 1,499 schools with 26,464 scholars, while the Roman Catholic Mission had 146 schools with 1,832 scholars. The revenue and expenditure (exclusive of that on account of Polynesian and Indian immigration) for the four years providing to 1900 have been as follows:—

Year.	Revenue.	Expenditure.
1896 ..	£73,869 ...	£73,099
1897 ..	74,492 ...	73,232
1898 ...	94,165 ...	87,594
1899 ...	98,621 ...	95,568

Production and industry are described as follows:—

There are five sugar mills in the Colony, with an aggregate nominal daily output of 204 tons of dried sugar, one tea factory, with an aggregate nominal daily output of 400 pounds of dried tea, 16 boat-building yards, two soap works, two saw mills. In 1899 there was under cultivation by European settlers:—Bananas, 2,228 acres; coconuts, 20,891 acres; maize, 518 acres; sugar-cane, 23,160 acres; yams, &c., 177 acres; tobacco, 34 acres; peanuts, 230 acres: tea, 210 acres; rice, 714 acres; pine-apples, 157 acres. There were in the colony, at the end of 1899, 2,083 horses; 16,940 cattle; 995 sheep; and 9,146 Angora goats.

In 1899 the value of the total foreign trade for the year was £744,900, of which £263,044 was imports and £481,856 exports.

The principal exports in 1899 were—sugar, 28,403 tons, valued at 340,603*l.*; copra, 7,617 tons, valued at 77,330*l.*; green fruit (consisting chiefly of bananas), 30,607*l.*; Colonial distilled spirit, 132,440 gallons, valued at 16,343*l.*; pea-nuts, 220 tons, valued at 3,182*l.*; pearl-shells, 39 tons, valued at 3,092*l.*; bêche-de-mer, 37 tons, valued at 2,344*l.*; maize, 13,660 bushels, valued at 1,366*l.*, vanilla, 9 cwt., valued at 1050*l.*

During the year 1899 the total number of merchant vessels entered at the ports of entry as arriving in the colony was 96 steamers of 115,237 tons, and 34 sailing vessels of 13,462 tons. Of these vessels 115 were British, two American, eight Norwegian, two German, one Danish and two Tongan. Total tonnage entered and cleared in 1899, 235,447 tons.

In 1899 there passed through the post office in local correspondence 267,910 letters, 163,077 papers, and 30,570 book-packets; and in foreign correspondence 153,536 letters, 145,637 papers, 23,009 book-packets, and 1,278 parcels. A Money Order system has been established with the United Kingdom, Canada and the Australian Colonies. An overland telephone from Suva to Ba, 120 miles, has been constructed.

Moneys, weights, and measures are the same as in the United Kingdom.

PRODUCE AND PLANTING.

Referring to Kenghung tea, the British Consu at Chiengmai, Siam, says;—"The import of this tea to Chiengmai and Moulmein is a novel one. The Yunnanese purchase the tea chiefly in circular bricks for convenience of pack transport in the town of Kenghung which is the centre of a large tea-growing district. This tea brought south is of an inferior kind, being the older shoots of the 'mieng,' or tea plant. It is steamed like rice in copper pots, with a cloth over the mouth of the pot and when sufficiently steamed is turned out and squeezed in the cloth till fairly dry, when it is ready for sale. The weight of one of these pudding-like bricks has been found to be 1 lb. 12 oz. The price in the Kenghung market is from 6d to 10d per choi (3 1-3 lb); in Chiengmai, from 1¼ rupees (1s 8d) to 1½ rupees (2s); and in Moulmein, from 2 rupees (2s 8d) to three rupees (4s) The tea is rather strong to European palates, but is appreciated by Burmese and Shans, who steep it in water before using. The best class of Kenhung tea does not come south, but is transported in cubes to the Yangtze, where it finds a better market. The medium class is taken by Talifu muleteers to Mandalay for Burmese consumption. This same 'mieng' grows wild on all the hills sound Chiengmai, and there is a large local consumption of the leaf, not as a beverage, but is a quid for chewing and eating."

The Mexicans grow coffee, but they do not drink much of it, and as for tea, the rural Mexican scarcely knows what it is. They have their own fermented drinks, and very deadly they are. There are three beverages which in Mexico supersede wine in the taste of the common people, and convert thousands of fine men and women into wrecks. These are pulque, mescal, and agurdiente. Pulque is the favourite drink of the respectable class who are not satisfied with ordinary wine. It is regarded as an exquisite luxury. The Mexican writers generally glorify this concoction. It is peculiar to the country, being the product of a magnificent plant of the aloe tribe, the Agave Mexicana, which is amazing in its sugary richness. A far more deadly drink is the famous mescal, another fermented extract of the amaryllidæ or aloe tribe of plants. For the rural Mexican this mescal is the most precious of all potations. It is distilled from a very different species of the aloe—very different from the ordinary pulque-producing agave. The mescal plant is a kind of century flowering giant cactus; that is to say, it shoots out a magnificent spike of bloom only after an interval of many years.—*H & C Mail* Nov. 29.

TRINIDAD AND TOBAGO.

The report of the Colonial Secretary of Trinidad for last year shows considerable prosperity in the colony, in spite of the export of sugar being the smallest for 20 years past. The revenue was greater than in any of the previous five years, and was much in excess of the expenditure. The public debt at the end of the year was £918,472, or less than 18 months' revenue, and more than three quarters of it represented directly remunerative public works, especially the railway. Large harbour improvements are in contemplation, and a complete system of roads, connecting the settled districts and opening new country, is about to be carried out. The margin of taxable capacity is large, for the taxation is light and is mostly indirect. The imports amounted to 2½ millions sterling, and the exports to a little more. Cocoa, sugar and asphalt are the staple exports. Of the countries sending imports Great Britain sent about a third last year, Venezuela and the United States about a fourth each. The transit trade, which forms about a quarter to the total trade of the colony is almost wholly with Venezuela. Even the heavy additional duty of 30 per cent on imports from Trinidad, imposed about ten years ago by Venezuela, has not killed this trade, thanks to the natural advantages of the position of Trinidad. The island, too, is favourably situated for commanding the trade of the rich Orinoco valley, which is now being in some measure developed from Trinidad. Cocoa is now the staple product of the colony; the area under its cultivation is nearly twice that under sugar, and is extending daily. Cocoa, however, is not, like sugar, a manufacture, and a given quantity of it represents far less expenditure on wages than is the case with sugar; but it maintains a large number of peasant proprietors. As to the sugar industry, the old system of a boiling house attached to each plantation has passed away; the planter is now primarily a manufacturer, and cane farmers have come into existence who do nothing but grow the cane and then sell it to the mills. The farmers are in many cases peasants with only a few acres cultivated by themselves and their families. The population is about 272,000, the East Indians numbering about 78,000. "Throughout the bulk of the population the proportion of African and European blood in each individual is unascertainable. The oldest Creole families of European extraction are of French or Spanish origin, and a Corsican element has contributed many Italian names. A French *patois* is the common language in the north of Trinidad, and in certain places Spanish is generally spoken. In Port-of-Spain there are always Venezuelan, Spaniards, and many Portuguese shopkeepers. In the country the shops are frequently kept by Chinese." The report states that life is easy in the colony, the demand for labour is in excess of the supply, and so wages are high; the Creole labourer values leisure above all things, and so East Indian labourers are imported. These almost invariably remain at the end of their term, and swell be ranks of free labourers and peasant proprietors, though they are entitled to be restored to their own country if they so desire. The Indians are always thrifty, and there is no intermarriage between them and the negroes.—London *Times*, Nov. 26.

NOTES FROM THE NORTH.
HARVEST AND OLD COFFEE DAYS IN CEYLON.

TEA AND WEEDS VS. CLEAN TEA AND BLIGHT.

Aberdeenshire, Nov. 25.

I see you are off to the land of the wild Hindu, and am sure you'll enjoy it. I always think Hindustan and its people are so high caste compared with any other nation. There is something swagger about those high caste Rajahs that we can't come up to in our sober Britain. I'll be looking forward to your notes on your travels. We have had a very good harvesting, although, of course, farmers are never pleased. I am, however, struggling along, glad to have good health, and always working beneath my estimates. That is the only plan to keep on the safe side. Grain is going up very much in price, which we rejoice in, but beef and mutton are drooping, the people are eating too much foreign stuff. Live stock killed at the port of landing must be poor eating, as they have been sea-sick and the meat soft. In an interesting article in the *Observer* under the heading of "Planting in Java," the writer deprecates an ultra-cleanliness from weeds as being conducive to an increase of diseases in tea, and that 'grey blight' first made its appearance, in Java, on an estate, kept extra clean by a Ceylon planter. I quite agree with him, and have always maintained that hand weeding was the worst thing that could be done, as it caked the surface, and kept the air from getting at the roots. Of course it is very pretty to see a clean estate, but one, not quite so clean, with the weeds dug in with forks, is much more profitable. I also observe that Mr Henry Cottam, in his "Uva Revisited," in reference to the coffee which he was still flourishing, says that it evidently likes to grow native fashion, and that cultivation and artificial manures helped to kill it. This is also quite true: the coffee estates which were most highly cultivated, and got the greatest quantity of artificial manures applied to them, are now the most dead of any in the Island,—Queen Anne is much more lively than they. This same penchant for artificials has ruined many a farmer in this country, beside leaving the farm, which he had on lease, as barren as the desert of Sahara.

In J L S.'s notes of his planting career, he refers to the Directory of 1864-65, and does so in a somewhat disparaging way, because it appeared without his name in it, although he had been several months in the Island. I also have the same complaint to find with the 1864-65 Vol. for I had been several months in K D & Co's. office in Kandy before it came out, and yet my name was conspicuous by its absence. I remember visiting Gona-Adika, when J L S and Spencer Shelley were *sina durais* to Greenwood, and we played cricket on the barbecue, with a gang of coolies to field for us; and, although that was 36 years ago, I have no doubt we three are still good for a game of cricket, if we had the leisure and the opportunity. I dare not write more of those old days, else I'll weary you; so with plenty salaams and best wishes for a Merry X'mas and a Happy New Year, COSMOPOLITE.

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THE LATE SIR GEORGE BANNERMAN, BART.

(*By one who knew him*)

"'Mr. Bannerman' had been settled in Canada for ten years when he took a run home to Aberdeen, where he was born and his family had been located from time immemorial down to modern times, and a city his uncle, Sir Alexander Bannerman, had represented in Parliament. In Aberdeen he met R B Tytler who told him that Ceylon was the place, and coffee the means, by which to acquire a fortune. The advice sounded good to the Canadian; so he determined to follow it, and clear out of Canada as soon as he could. He came out to the island, bringing many letters of introduction, including more than one to the great firm of that day as agents for coffee estates—Keir, Dundas & Co., Kandy—and sought a billet. None of the introductions provided a berth for him. John Gavin, the managing partner then of K D & Co., a rough diamond, brought out more of the roughness of his nature than the better side when the applicant for a berth sought him. But this better side was amply shown afterwards when Bannerman, ill with fever, lay almost friendless in Nuwara Eliya. Often in after years did he talk of the great kindness he there received from the Gavins. Often also did he 'yarn' about his experiences when after first landing at Galle he proceeded to Colombo; but any one of that date could probably very fairly fill up the details of that journey themselves.

"One of the first estates he stayed on was Charles Dixon's

MAHABEERIATENNE IN DUMBARA.

They had travelled by the same steamer. Here he made acquaintance with Ceylon parrots and pigeons, and afterwards used to declare they were not to be equalled in beauty elsewhere, any more than the road thither from Kandy was easily excelled in beauty. He was always a keen admirer of nature, and especially interested in birds, which he skinned skillfully and very readily for friends who formed collections. At Mahabeeria was a tall old Scotchman, named Bruce, of about 6 feet 6 or 7 in height, to whom he at once took. Bannerman was well above 6 feet and broad in proportion; but he felt small beside Bruce who came from some sugar estate in Jamaica, and used to tell of having yellow fever there and of his coffin being prepared by an enterprising carpenter, and not being required that time was kept by the tradesman standing in his shop on end like a great sentry-box. It was there when Bruce left the West for the East Indies! Bruce got on well with coolies though he could master no Tamil, and only addressed them in broadest Scotch. He was when first Bannerman saw him stoking an engine with ebony—no doubt small wood and worthless but

one fresh from England was accustomed to regard all ebony with a certain amount of respect and the proceeding rather startled the newly arrived! He took Bannerman to neighbouring estates and introduced him to planting life. Amongst other places he took him to Rajawella (then lately recovered by the Lindsays and Aberdeen Haddens from the Oriental Bank, as the result of their great law-suit); and showed him the fine coffee trees planted by Colonel Lindsay between the road and the bungalow, then over seven or eight feet high, some nine feet apart, now represented only by stumps in the rooms of the Ceylon Association in London, taken home by the late Peter Moir. On Bannerman asking how the fruit was gathered, Bruce said they keep some 'climmen boys' (*anglicé* climbing boys) to pick it.

"The first berth was given to Bannerman by Dr. Kelson, to whom he was on a visit, and who had

A WATER-WHEEL

he wished put up. He asked his visitor if he could erect it, and received as answer 'Certainly.' Kelson asked if he had ever put one up, and was answered 'Never.' 'Then how do you know you can put it up?' The question seems almost ridiculous to the visitor who was ambi-dextrous and could do anything with either hand from fine fretwork to building a house or factory: and in rough building had had great experience in Canada. The answer on the other hand seemed mere self-confidence. At last Kelson offered a sum down to be paid when the water-wheel was satisfactorily in it place. On this Bannerman made 50 per cent, and never after that did he lack a berth. He was always fond of Kelson who gave him a start as planter. He afterwards was superintendent of one of the Haddens' estates under James F Moir, and was the first with him when he was poisoned. There are still some alive who remember that tale.

"Bannerman left the island with Stewart and McIntyre for Cochin, where he suffered severely from fever and afterwards went to Goa, where he cleared land for coffee and where he suffered more severely still from fever. He finally left India in June, 1868, for England, and never afterwards quitted Britain's shores. He married in 1869 the eldest daughter of Mr. Richard Brooke, F.S.A., niece of Mr. Charles S Hadden. He was also uncle to Mrs. John Anderson, of Gorthie, Dikoya, and stood as great uncle to her children, so he had many ties with Ceylon beside those of friendships.

"He used to be interested in 'the Ceylon Mounted Infantry,' for in Canada he had raised the St. Thomas Troop of Volunteer Cavalry when the Crimean War had denuded of regulars all those colonies and they found they had to provide their own forces. The Canadians were not slack in that respect than any more than now. Captain Bannerman retained the command of his troops until 1860 when he retired, retaining rank and right to wear the uniform.

"He succeeded to the baronetcy on the death in 1877 of his cousin Sir Alex. Bannerman of Crimonmogate, Aberdeenshire, the estate of Crimonmogate falling to Sir Alexander's only child, Ethel Mary Elizabeth, now married to Lord Carnegie, son of the Earl of Southesk. The baronetcy was conferred by Charles II. upon Sir Alexander Bannerman for 'his constant loyalty during the rebellion and of the heavy calamities he had suffered on that account.' The history of the family is written in that of Aberdeen and lately Brown, the publisher there, has been printing a good deal about the later members, including that inveterate joker, the first M.P. for the town, Sir George and Lady Bannerman settled at East Hill, Brackley, Northamptonshire; and when Brackley received a new charter granting the place a Mayor and corporation Sir George was named in the charter as the first mayor.

Sir George was a good shot and fisherman, a fine man physically, a fond father, and true friend. He will be long missed. His successor as the eleventh baronet is his only son, now Sir Alexander Bannerman, Bart., in the Royal Engineers, who is serving in South Africa. He received his orders the day after war was declared, immediately embarked and has ever since been hard worked in almost every part of the field of operations. He was honourably mentioned by Lord Roberts.

TIGER MEASUREMENTS: MR DEANE'S RECORD BEAST.

(*To the Editor, "Madras Mail."*)

I had the pleasure of measuring a male tiger shot by Mr Deane on the 23rd ultimo, which taped 10 ft. 3¼ in. measured from tip of nose to tip of tail, as he lay. Subsequently, on reading "Tiger Measurements" in the "Encyclopœdia of Sport," I see that the record authenticated measurement is that of a tiger shot by the Maharajah of Cooch Behar, measuring 10ft. 2½in. It would be interesting to know whether the tiger shot by Mr Deane is a record one.

Peermaad. 15th Dec. D W ARTHUR.

—*Madras Mail*, Dec. 18.

NEW RUBBER COMPANY.

Anglo-South American Rubber Synd, Ltd. (71,918).—Registered Nov. 20, with capital £1,000 in £1 shares, to acquire lands, plantations or estates in Bolivia, Peru, Brazil or elsewhere, and to carry on the business of India rubber, gum, coffee, tobacco and general planters and merchants, explorers, etc. No initial public issue. Registered without articles of association by T T Hull & Son, 22, Chancery Lane, W.C.—*Investors' Guardian*, Nov. 30.

HINTS FOR ORANGE GROWERS.

Treatment of the soil with gypsum, followed about ten days after by very weak solutions of iron sulphate, enables many possessors of orchards of Portugal oranges to retard the ripening of the fruit for some considerable time, at the same time these substances tend to fix the fruit on the tree. The blood orange, which can be successfully cultivated in so few countries, in Egypt improves in every genera-

tiou upon its parent. It is grown from seed. Those whose crops do not come up to expectations, especially those who are experimenting with new varieties, should recollect that orange trees require plenty of soil, copious watering, accompanied by perfect drainage and plenty of manure. They can rest assured that the orange will most surely give a full return for all nutriment properly given to the soil. From an average of several analyses of orange trees the following percentages have been obtained:—Fresh fruit contains 0.38 nitrogen, 0.40 phosphoric acid, 0.38 potash; fresh leaves contain respectively 0.70, 0.10, and 0.38; while fresh wood contains 0.70, 0.50, and 0.73 of nitrogen, phosphoric acid and potash. In returning these substances to the soil it should be noted that the effect of nitrates is to produce excessive growth of wood, leaves and skin; phosphates promote quantity, but poorness in the fruit; potash dwarfs the size of the tree, but increases juiciness, sweetness and flavour in the fruit. Accordingly none are in themselves sufficient fertilisers but combined in proper proportions they complement each other, counteract each other's bad qualities and produce the desired results.—*Egyptian Gazette*, Dec. 2.

THE DEVELOPMENT OF BRITISH GUIANA.

INDEPENDENT PLANTING EFFORTS VINDICATED.

With reference to a letter signed "Fair Play" and published in our issue of November 15th, dealing with the development of British Guiana, we have received letters in reply from Mr. J E Tinne and Mr. Allan Messer, from which we give the following extracts. Mr. Tinne writes:—"Dr. Morris spent ten days in British Guiana with the Royal West India Commission in 1897, and during that time he attended the inquiry and visited my own and other sugar estates, and delivered an address to the Royal Agricultural and Commercial Society upon the possible agricultural products of the colony other than sugar, and after the issue of the report of the Commissioners the retiring president of the society, Professor Harrison, subsequently replied as follows:—'Dr. Morris has alluded to the great fertility of the interior of this colony. I do not know on what grounds he based his supposition of this great fertility, I can find no grounds for believing that, in a country having the geological structure the interior of this has, great tracts of land of exceptional fertility will occur, although possibly tracts of limited area may occur in valley land and river bottoms or on the lines of dykes of certain classes of intrusive rocks. I may mention that as far as my analytical examinations of some hundreds of the soils of the interior and seaboard of this colony extend, no indication of exceptional fertility in soils other than those of our alluvial coastlands have been obtained. All point to the wisdom of our Dutch predecessors in ceasing their attempts to raise economic agricultural products on many of the soils of the interior.' The proprietors of sugar estates do not deserve 'Fair Play's' sneer; they have never claimed to be held up as benefactors of the colony because they expended money liberally from private resources to keep their estates and labourers in existence. They did so for self-preservation for sugarcane is a continuous crop (unlike beetroot), and machinery unused even for a year in he tropics rapidly deteriorates. As regards their ontribution to the general revenue, I would refer him to the tax ordinances, which will give him the information he desires. I am totally unaware of Mr. Laing's reason for voting as he did; he certainly does not take his instructions from my firm, nor do we fetter his judgment in any way, and in the combined Court he represents Berbice, and not us." Mr. Messer writes:—"Sugar estates in British Guiana do pay a direct land tax, while in addition, as the revenue of the colonial Government is principally derived from Customs duties on imports to which the estate owners are large contributors, the colony would be bankrupt in a day without their assistance in this respect. It seems to be assumed that the planters are responsible for the failure to develop the resources which the interior of the colony undoubtedly contains. Nothing could be more unfair. The sugar estates are all on the coast line, and their owners, while the importation of beet sugar into the mother country continues to be assisted by foreign bounties, have all their work cut out to meet that competition without being saddled with a responsibility which does not really concern them."—London *Times*, Nov. 29.

SNAKE HAD NO TOOTHBRUSH.

CURIOUS STORY FROM DR. CALMETTE.

Paris, Sunday, Dec. 1.—Dr. Calmette, director of the Pasteur Institute at Lille, who was recently bitten by a most poisonous snake, tells the following story of the occurrence:—

"I was handling the snake, when one of his fangs touched the third finger of my right hand. I felt nothing at first, but presently found blood began to flow. It was easy to understand what had happened. I ran and placed my finger under a tap. Without delay one of my assistants inoculated me under the skin of the stomach with an injection of serum, and in less than five minutes the numbness and the pain had ceased."

A day or two later, finding that the wound did not heal, a surgical operation was performed. This had nothing to do with the snake venom, which had been completely eliminated from the wound. Necrosis had set in from infection of the open wound, and the doctor concluded with a laugh. "I suppose the reptile had forgotten to wash his mouth."—*Daily Express*.

MR. HENRY BROWN'S PLANTING EXPERIMENTS IN B. C. A.,

Many readers will remember the specimens of fibre, Gum Arabic, etc., which were exhibited at the last Agri-Horticultural Show by Mr. H Brown, Mlanje. These were given by Mr. Brown to Mr. Cox, the President, and he sent them home to Messrs. H J Gardiner & Co., with a request that they would procure a report and valuation. Mr. Cox has now sent this report for publication, along with the specimens of the fibres which may be seen at this office. A sample of India rubber made from the Ceara tree and exhibited by the African Lakes Corporation, Limited, was also sent home at the same time and is included in Messrs. Lewis and Peat's report, which is dated June 1901, and is as follows:—

We have carefully examined the samples contained in the box *ex* Illovo and beg to report upon same as follows.

Aloe:—Good length and strength, rather brown—(should be got white if possible)—value about £25 to £27 per ton; perhaps more, readily saleable,

Plantain:—Fair length and strength, value about £20 per ton, readily saleable.

Pine Apple:—Nice length and strength. Saleable in small lots. Value £15 to £17 per ton, if whiter possibly £20 per ton.

Sanseviera Cylindrica:—Of good strength and fair length; rather poor colour, about £10 to £20 per ton.

anseviera Guincensis:—Same character as above but not so good—value about £15 per ton.

China Grass:—Very poor quality and probably next to no value.

Rope:—Would not sell in this market.

India Rubber:—Fine nead clean ball, worth about 3s per lb and readily saleable.

Gum Arabic:—(labelled Animi): Of no value and insoluble.

Anatto Seeds:—Of no commercial value being very dull in colour. If bright good colour 1½d to 2d per lb. might be obtained.

Turmeric:—Of no value in its present condition; it must be dried before shipment.

This report is distinctly encouraging, especially as regards the Fibres. The Aloe, for example, grows well all over the Shire Highlands and if a machine exists for successfully treating it in large quantities it should pay at the prices mentioned in the report. It would require to be planted on a large seale however, treated by machinery, packed in a press and sent down river at a low freight in addition to a low freight from Chinde to London. £25 a ton is a little less than three pence per lb, so that it will be clearly seen that after the expenses of growing, preparing, and packing are calculated, the freight would have to be a very low one to allow of any profit at all. It is calculated that at present freight rates it takes about £12 per ton to sell a ton of coffee of which freights are roughly £7-10 and were the fibre to cost the same amount it means that only about fifty per cent of the value in London would be available to pay cultivation, manufacture, interest, etc., and profit. On the other hand were the freights reduced by 25 per cent perhaps that very 25 per cent reduction would be the profit and would therefore decide the question as to whether the industry could be taken up or not.

The only other item in the list which is of special interest is the Rubber specimen. We have, however, no information as to the age of the trees when tapped, the method of tapping, and the effect on the trees after being tapped, and most important of all the amount of rubber yielded per tree. If the A L C can furnish these particulars it might be possible to come to some definite judgment on the worth of the Ceara as a rubber yielding tree.—*Central African Times*, Nov. 2.

INTRODUCTION OF COCOA INTO BRITISH CENTRAL AFRICA.

In my circulars on this subject, it was stated that the importation of cocoa seed was likely to be unsuccessful, the supposition being based on previous importations having failed. Fortunately, however, through the kindness of Sir W. Thisilton-Dyer, Director of the Royal Gardens, Kew, I am now able to state that cocoa plants may be successfully transported from England to British Central Africa. A consignment of 210 plants in two Wardian cases were despatched from Kew on the 14th June and arrived at Zomba on the 4th September having thus been 82 days in the cases. Although on arrival the lower leaves of the plants were withered and had fallen off, the plants looked in excellent condition, and just as if they had left the hothouse only a few days previously. Each plant was in its place and only three were dead. After the covers of the cases had been opened for several days to admit air, and allow syringing with water, the plants were taken out, and the roots of each were covered with sphagnum (moss) and securely tied—a few threads of any fibrous plant being sufficient—after which all were planted in a previously selected and prepared piece of ground. This was well dug and watered and was in a suitable state for their reception. It was considered advisable to top each plant so that strong plants with good roots will be ready to plant out at next rains. With frequent syringing and watering, the plants have now burst into foliage and promise well. To those who desire to import cocoa plants in quantity the following points should be observed. Seedlings should have matured a season's growth in three inch pots before they leave Europe, which should be at any time from June up to end of September, as there will be less danger of the plants suffering from frost at this period of the year before they reach the tropics. Plants leaving in June will allow of their reaching here in time to be treated in the nursery bed and become established before planting out in the succeeding rains. Nursery beds—which should not be in an exposed position—need not be shaded, as this would cause the plants to be weakly and "drawn." Plants leaving Europe in June or July will most likely have completed their season's growth, and be in a condition to stand shifting out of the pots and packing in the cases, and travel without much fear of their breaking into active growth on the way. This is a most important point, and one to which much of the success of this last consignment from Kew is due, together with excellent packing. The bottom of the case should be covered with two inches of sphagnum, with just a little soil, leaf mould and sand preferably. On removal from the pots the plants may then be placed closely together, one ordinary case holding just over the hundred. A little soil should again be placed over the roots so as to leave no empty spaces, and over this, say an inch or two of sphagnum, while above this may be placed three or four straws between each row of plants. These will keep the sphagnum from getting loose, and thus retain sufficient moisture. To securely fix the plants in the cases for the journey, some stout pieces of wood an inch and a half thick should be placed between each row just over the sphagnum and securely held down by means of two other pieces nailed along the side.

I was lately favoured with a price list of plants of economic products from the Colonial Horticultural Society at Brussels, and amongst these I observe that Cocoa plants may be obtained from Brussels at £5. 10s per hundred plants, cases and packing included. This, altogether with freight, appears rather costly; but when it is remembered that the importation of seed is so unsuccessful, this figure may be considered a fair one.

It is proposed that 100 of the plants lately received be distributed—at a nominal sum each to cover freight—to planters in B C A who are willing to give them a fair trial.—J MCCLOUNIE,

Head of Scientific Department.

—*B C A Gazette*, October 31.

THE ACCIDENT TO DR. CALMETTE.

SNAKE-POISON AND MALARIA.

Mr. J Claine, the French Consul in Rangoon, writes as follows to the *Rangoon Gazette* :—

MR. EDITOR,—I have the honour to forward herewith the translated copy of a letter just received from Dr. Calmette, Director of the Pasteur Institute at Lille (France), and inventor of the serum anti-venomous against the bite of snakes. Although this letter is private, the directions and advice therein contained having a general interest, I cannot resist to communicate it to you, sure that its publicity in your estimable newspaper, will prove an humanitarian boon.

The following is Dr. Calmette's letter :—

DEAR MR. CLAINE,—I wish to thank you immediately for the kind sympathy extended to me by your letter of the 28th October, with reference to the little accident of which I have been very nearly victim. I have had the bone-joint of the fourth finger traversed by the tooth of an enormous "Cothrop." Without the serum I certainly would have been in the other world. But the tooth of the animal being dirty caused a deep phlegmon of the one, and it was found necessary to take out a piece of it which was mortified. Now there is nothing the matter and I have resumed my work. I have just received from an English Doctor from Bombay a great quantity of dry venom of cobra. I am delighted! There are some good apostles—of whom you are one—who will very soon lessen the mortality by snake bites, for which the peoples of India shall bless us. I learn with regret that you have had to pay your tribute to malaria. Preserve yourself from mosquitoes which transmit it. Destroy their larvæ in stagnant pools of water in your neighbourhood. It is very easy; pour some petroleum over these pools every eight days, and do not sleep without a mosquito net. If necessary place some nailed round a frame to the windows of all the rooms where you are at night between sunset and sunrise. The mosquitoes that transmit malaria (anopheles) do not sting during the day, but solely after sunset. This notion is for your benefit.—Believe me, etc.,

Lille, Nov. 9. DR. CALMETTE.

—*M. Mail*, Dec. 24.

NEW RUBBER.

A new source of supply for rubber has been found out by M Deiss, a French scientist at Saigon. The forests inland in that quarter abound with lianas—creeping and twining plants which grow to a large size. These lianas yield rubber out of the juice from cuttings in the bark (the usual mode of gathering) but not in paying quantities. The fact that the bark, apart from the juice, holds rubber, had long been known; but nothing had been done to turn this knowledge to profitable account. M Diess was struck by this, and sought for means to get at the stores of rubber in the bark. It is said that he has met with success. The bark is treated chemically, and undergoes sundry processes including treatment by currents of hot and cold water alternately. The result is said to be the extraction of rubber of the best quality, which soon thickens and hardens. It took repeated experiments to show the right way to go to work. The out come is that a syndicate of capitalists in France has undertaken to start, in Cochin China and Tonquin, works for turning out rubber from bark, on the new system.—*Malay Mail.*

THE CALEDONIAN (CEYLON) TEA ESTATES, LIMITED.

REPORT OF THE DIRECTORS

to be submitted at the Fourth Annual Ordinary general meeting of shareholders to be held at the offices of the Company, on Thursday, 28 November, 1901, at 12 o'clock noon :—

The Directors beg to submit the balance sheet and Profit and Loss Account for the year ended 30 June, 1901, duly audited.

The working account, after providing for London charges, shows a profit of £4,191 13s. 10d., and the Profit and Loss Account, including the balance brought forward from the previous year, and after payment of interest on Debentures, &c., leaves an available balance of £2,019, 11s. 6d.

From this sum the Directors now recommend the payment of a dividend of 6 per cent. on the preference shares for the year to 30 June last, amounting to £1,920; leaving to be carried forward to the next year the balance of £99 11s. 6d.=£2,019 11s 6d.

The Directors regret that they are again unable to declare any dividend on the ordinary shares.

The yield of tea from the Company's estates for the past and two previous seasons was as follows :—

	1900-01.	1899-1900.	1898-99
	lbs.	lbs.	lbs.
Lawrence and Venture...	399,087	402,535	378,501
Selegama ...	167,378	111,415	94,278
Wavina ...	94,979	40,763	16,908
	661,444	554,713	489,687

The gross average prices obtained in London were :—

	1900-01.	1899-1900.	1898-99.
Lawrence ..	6·84d. ..	7·40d. ..	8·27d.
Venture ..	7·13 ,, ..	7·59 ,, ..	8·28
Selegama ..	5·79 ,, ..	6·52 ,, ..	7·03
Wavina ..	5 64 ,, ..	6·39 ,,	(Sold in Ceylon)

70 cwt. of cocoa were secured from the Kahawatte and Wavina estates, and sold in Ceylon.

The above figures show that the total quantity of tea produced was 106,731 lbs. more than the previous season's crop, and 41,444 lbs. over the estimates. Owing, however, to the low prices prevailing during the greater portion of the year, in consequence of the continued excessive supply, the profit shows but a small increase, although the cost of production was considerably reduced.

The statistical position of tea generally has lately much improved, and it is estimated that the supplies from all sources for the current season will be much below last year's yield. Prices have consequently shown a marked improvement during the last few weeks, and the outlook for Ceylon tea is at the present time more promising than it has been for some years past.

The estimates for the current season are given by the Manager in Ceylon as follows :—

Lawrence and Venture ...	400,000 lbs.	Tea.
Selegama	175,000 ,,	,,
Wavina	100,000 ,,	,,
	675,000 ,,	,,

and about 82 cwt. cocoa.

The Directors have to record with much regret the death, in March last, of Mr. Stanley Ross, who had acted as general Manager in Ceylon since the formation of the Company. They had in consequence to make other arrangements for the administration of the Company's business, which have so far proved quite satisfactory.

In accordance with the articles of Association, Mr. David William Rennie retires from the Board, and, being eligible, offers himself for re-election.

The Auditors, Messrs. Singleton, Fabin & Co., also offer themselves for re-election.

THE WYNAAD TEA COMPANY.

The following is from the report of the directors to be presented at the seventh annual meeting of shareholders, to be held at No. 7, Mincing Lane, at the office of the company, on Monday next:—

The directors regret to have to report the loss of their esteemed colleague, Mr. Donald Andrew, who died in February, 1901. They thoroughly appreciated his valuable services during the short time he was in office The vacancy created on the board by his death has not yet been filled. The past season has only partially fulfilled the expectations of a year ago. The crops have very nearly reached the earlier estimates of both tea and coffee, but prices have proved extremely disappointing, and account for a deficiency in the year's results of about £1,900. The coffee crop, estimated roughly at 40 tons, has yielded about 36 tons, which sold for only £40 per ton against an average of £70 per ton in the four previous seasons. The tea crop, estimated at about 150,000lb, has reached 146,750lb, and was sold for an average of 5½d per lb against 7½d per lb the year before. The pepper crop estimated at 18 tons, has actually turned out 20 tons, and has realised £187 over the estimate. The net proceeds of the three crops amount to £5,134 12s 5d, against and expenditure in India of £3,716 10s 2d. The directors have again transferred a large proportion of the revenue from tea to capital account, representing the 410 acres not yet in full bearing. The result is consequently a loss of £1,290 14s, carried to the debit of profit and loss, whilst £1,640 0s 9d have been debited to capital account. The tea and coffee trades have passed through a severe crisis during the past eighteen months, but both are now in a healthier condition, and are gradually returning to a more normal state. The over-supply of tea from Ceylon and Assam is finding fresh outlets, whi'st crops are reported to be somewhat smaller, more attention is being paid to the production of a better article, and prices have recovered fully 1d per lb. from the recent lowest level. Prices of coffee have recovered considerably during the past three months and although the present Rio and Santos crops are the largest on record, the reports about the Brazil crops of 1902-1903 are extremely unfavourable, and point to a much higher level of prices for next year. The estimates for the current season are based upon a tea crop of 190,000lb, a coffee crop of 20 tons, and a pepper crop of 20 tons, and with the strictest economy in working the estates, without sacrificing efficient cultivation, the directors hope for better results. In making provision for the current year's up-keep, the directors have found it necessary to issue the balance of the debentures—viz., £2,000, and they have shown their confidence in the undertaking by subscribing for them in conjunction with Messrs. R and J Henderson.—*H. and C. Mail*, Nov. 29.

HORNSEY TEA ESTATES COMPANY, LIMITED.

The Directors beg to submit to the Shareholders the report and audited accounts for the year closing the 30th June last.

The crop of tea has weighed out 176,885 lb, against last year's crop of 191,844 lb, or a decrease of 14,959 lb. of made tea.

The period under review has been the most disastrous in the history of the tea trade. Largely increased crops, both from India and Ceylon, brough prices down to a level never before known, and in the case of many gardens below the cost of production. Unfortunately, the Hornsey Estate has had to suffer with all estates in accepting lower prices for its produce; but owing to the excellent tea produced, the result is not so unfavourable as might have been expected.

Turning to the future, the directors are able to state that prospects are more hopeful; the severe lesson in over-production has had a marked effect in reducing crops, and prices are considerably higher since July last.

The cost of production with manufacture has been 30·84 cents, against last year 29·30 cents, or, in sterling, 5d per lb. Colombo against 4¾d per lb.

The London sales have totalled 27,915 lb. of tea, selling at an average of 8½ per lb. gross, and the balance of the crop has been sold in Colombo, and realized an average 38·68 cents per lb. The average sale price for the whole crop has been equivalent to a London price of 7·47 per lb. gross against last year 7·94 per lb.

A factory has now been finished and fully equipped with the necessary machinery, and the Company since July has manufactured its own leaf. The first invoice made at the factory is advised as selling at an average of 49 cents.

Against the expenditure on the factory £2,000 in Preference Shares have been issued.

The audited accounts show that after paying all fixed charges and the Preference Dividend for the twelve months, there is a balance of £43 15s to carry to the debit of profit and loss account.

The Directors desire to express their thanks to Mr W S T Saunders and to Messrs. E Benham & Co, the Colombo agents, for the attention given to the Company's interest during the year.

In accordance with the Articles of Association Mr Charles A Reiss retires from the board, and, being eligible, offers himself for re-election.

The Auditors, Messrs. Singleton, Fabian & Co., also offer themselves for re-election.

CHARLES A. REISS and WALTER S. SICHEL,
Directors.

ALBIN B. TOMKINS, Secretary.

51, Lime Street, E.C.
London, 6th Nov., 1901.

THE CALEDONIAN (CEYLON) TEA ESTATES, LIMITED.

The following is from the report of the directors to be submitted at the fourth annual ordinary general meeting:—

The working account, after providing for London charges, shows a profit of £4,191 13s 10d, and the profit and loss account, including the balance brought forward from the previous year, and after payment of interest on debentures, &c., leaves an available balance of £2,019 11s 6d. From this sum the directors now recommend the payment of a dividend of 6 per cent on the preference shares for the year to June 30 last, amounting to £1,920; leaving to be carried forward to next year the balance of £99 11s 6d. The directors regret that they are again unable to declare any dividend on the ordinary shares. The total quantity of tea produced was 106,731 lb more than the previous season's crop, and 41,444 lb over the estimates. Owing, however, to the low prices prevailing during the greater portion of the year, in consequence of the continued excessive supply, the profit shows but a small increase, although the cost of production was considerably reduced. The statistical position of tea generally has lately much improved, and it is estimated that the supplies from all sources for the current season will be much below last year's yield. Prices have consequently shown a marked improvement during the last few weeks, and the outlook for Ceylon Tea is at the present time more promising than it has been for some years past. The

directors have to record with much regret the death, in March last, of Mr. Stanley Ross, who had acted as general manager in Ceylon since the formation of the company. They had in consequence to make other arrangements for the administration of the company's business, which have so far proved quite satisfactory.—*Home and Colonial Mail*, Nov. 22.

NEW COMPANY: KALKUDAH COCONUT ESTATES, LTD.

This is the title of a new Company, the memorandum and articles of Association of which are given in the *Ceylon Government Gazette*. The principal object for which this Company has been formed is to purchase the Kalkudah coconut estate in the district of Batticaloa, containing 507 acres for R113,000 as from 1st October last. The signatories are A O Tranchell, Winifred Z Tranchell, Oliver Collett, E F Tranchell, F L Tranchell, F J de Saram and George de Saram who take one share each. The original capital of the Company in R250,000 divided into 2,500 shares of R100 each. The qualification of a director is the holder of shares or stock of the nominal amount of R500. The first directors of the Company are Messrs. E F Tranchell A O Tranchell, and Oliver Collett.

"TEA TRUST, LIMITED:" A NEW COMPANY.

Registered on November 16, by Walker and Rowe, 8, Bucklersbury, E C, with a capital of £20,000 in £1 shares. Object to carry on the business of tea merchants, brokers, and planters, tea, coffee, and cocoa dealers, general grocers, wine and spirit merchants, manufacturing chemists, dealers in chemicals and chemical products and appliances, &c. No initial public issue. The first directors (to number not less than three nor more than seven) are to be appointed by the subscribers. Remuneration as fixed by the company.—*Financial News*, Nov. 22.

BRITISH CENTRAL AFRICA PLANTING NOTES.

Our hopes of good prospects for next year's Coffee output, which were raised considerably by the very fine blossom showers we had are diminishing in exact ratio to the time the rain holds off. It is certain that the blossom however well set cannot stand an indefinite prolongation of this strong November sun. This is exactly where the shade would come in. For a large part of the year shade is not required but at this critical time it is all important. Where the young berries in the open will be scorched those in the shade will be able to hold out until the rain comes and this is the great argument for shade in a country where the blossom showers and early rains are so uncertain. It is to be hoped however, that before many days are past more rain will fall and put the young crop beyond danger. It is certainly most discouraging that such splendid blossom showers should be followed by a spell of abnormally hot weather. It is apt to make some people despair of Coffee. To our mind it simply emphasises the need for shade and—irrigation perhaps.

We say "perhaps" because irrigation is not a panacea for all the ills under the sun. Like shade it may do harm or good. Some people have tried irrigation and have met with nothing but failure; others have been more successful. Irrigation requires almost expert skill in application or else it is not only useless but worse than useless—harmful. With regard to Coffee, experience so far has resulted in a number of "Don't" maxims. Don't run on irrigation in the hot sun but only in the very early morning the evening or night. Don't flood your field or run it on wholesale. Don't try it on very steep land. The only successful method we know of is to run it slowly, very slowly in small quantities between the lines of coffee or into catch pits between every four trees and let it soak in. Never put it round the tree or directly to the roots. It must soak in gradually through the earth and in doing so it gets heated to the required temperature. The best plan is to catch pits filled by small rills and after allowing the water to soak in turning it off for a time. Probably it would only require to be done once, but that once might save a crop.

We have received from Mr. J. Dickie of Mr Sharrer's Mpenda Estate and leaf off the West African tree and on comparing it with the plates in the monograph on Funtumia Elastica it appears to be identical. It is satisfactory to know therefore that we have specimens of this tree growing in the country and in a few years' time there ought to be seed for distribution. Mr Sharrer certainly deserves credit for his persistent efforts to carry on the planting industry, and we hope that success will attend his efforts to introduce new plants. We hope also the Scientific Department will make further inquiries with reference to the possibility of getting seed of the Funtumia Elastica as it worth a considerable amount of trouble if only it can be established. Failing seed then a few more Wardian cases of Plants should be imported and the different plants set out in different districts as it is just possible that the trees already introduced might not come to seed through accident or otherwise. The conditions of such districts as Mlanje, Blantyre and Zomba vary so widely that it is well to test new products in each district. The rainfall of each district and the mean annual temperature vary considerably and a product might be a success in one and not in the other. These local variations are not sufficiently taken into account. For example tobacco grows well at Mlanje nearly all the year round. On the other hand in the Blantyre and Zomba districts tobacco will not grow well from May to October and should be planted always in the rains if heavy crops are wanted. Tobacco seed should be sown now and planted out in December, January and February or March if rains are favourable.—*Central African Times, Nov 9.*

PLANTING NOTES.

PLANTING IN BRITISH CENTRAL AFRICA.—In this issue we give the latest planting information from British Central Africa which shows how the country is going ahead with new products. In the latter we are glad to note Mr. Henry Brown's success, with fibres especially; and cocoa, too, it will be seen, is making a good start. As into every other corner of the British Empire, the volunteering spirit has reached British Central Africa and a volunteer reserve had taken shape, before the King's first (regal) birthday, at Blantyre.

A LARGE MANGO.—During the present season I was favoured by Adam Smith, Esq., with a fruit from a mango tree purchased as a seedling from the Botanic Gardens. The fruit measures 7·5 inches in length, and 4·5 inches wide. Its weight was over 2 lb. The flavour was excellent and proved it to be from the 'Gordon' mango, a well-known type described in a former Bulletin. —*Trinidad Bulletin* for October.

CINNAMON SALES IN LONDON.

ADVANCE IN PRICES.

The particulars received of the Quarterly Sale of Cinnamon held in London at the end of November, and published by us elsewhere, confirm the tenor of the private telegraphic intelligence we published some weeks ago. The very small proportion of which the finer qualities of bark bore to the total offerings, explains the notable advance of 1d. to 2d. per lb. which the leading marks obtained. The 291 bales catalogued as "worked," represent the crops of the Kadirana Estates which have always secured top prices; and Golua Pokuna, as a matter of course, stands first in the list. It is something to make the mouth of the Tea Planter water, to read of Firsts fetching 1s. 8d. per lb., and Seconds and Thirds realising respectively 1s. 6d. and 1s 5d. while Fourths (the 'souchong' of spice) command 10½d. But, then, there is no Mariawatte among Cinnamon Estates prospering on an outturn of 1,000 lb. a year? The average, happily, is only about one tenth of that formidable figure, while the cost of production and cultivation must, we fancy, average above one-fourth of the gross prices realised in London. Even so, there has been over-production, through the opening of new land, and the conversion of paddy-fields, through raised ridges into Cinnamon gardens, with the result that prices receded fully 50 per cent, and even as much as 66 for the coarser barks, during the 'seventies and 'eighties. It is only during the last decade that prices have reverted to something approaching those of thirty and forty years ago—to go no farther back to the time when cinnamon was a Government monopoly. The extent to which production has grown is evidenced by the fact that quilled bark is exported now to the extent of 2½ million lbs. and upwards, while chips which were formally treated as refuse, or were used only for the distillation of oil, have run up to nearly two million lbs. in recent years. When we say that, in the first years of British rule, the exports (on which the duty at one time reached 3s. a lb.) seldom approaches half-a-million lbs., and that as late as 1850, the total quantity exported was only 665,000 lbs. some conception may be formed of the wonderful development of the trade during the past half-century. Almost the sole uses to which the spice was put then, were connected with the culinary art and the preparation of incense for Roman Catholic worship in Europe. Since then it has been very widely used in confecfectionery—notably chocolate creams and lozenges and in puddings and custards—in specially prepared cattle food (like Mr. Thorley's), in the sick room as an antiseptic of recent discovery, though the natives from time immemorial burnt it to keep off flies and dropped a piece into boiling milk to keep it sweet, and in far larger quantities than before, both medicinally and in public worship. With all that, the supply is even yet somewhat in excess of the demand; but, happily, there are two important factors which operate against a rush of over-production. Manuring coarsens the bark and renders it less valuable, so all the cultivation the bush gets is from the burial of the leaves and weeds; and, secondly, the manufacture of Cinnamon is a caste industry. The castes which consider themselves above the Chaliyas will not take part in the preparation, and thus the outturn is to a great extent limited by the available skilled labour which is now secured with difficulty under a demoralising system of advances with much resulting chicanery.

To return to the last Quarterly Auctions for the year, which are generally the heaviest, the quantity offered was more than double that brought to the hammer in August last, but almost the same as was offered at the corresponding sale in 1900. Of this large quantity, the whole of the "worked" spice was sold outright, realising an average advance of 1½d a lb.; and of the 1,399 bales "unmarked"—*i.e.* not examined and repacked in London—1,212 bales found buyers at a decline of about ½d, which is a very moderate fall, considering the quantity cleared. The prices realised for the quillings and chips were also satisfactory; and a yet further pleasant feature was the neglect of the fraud known as "wild cinnamon" which, as often as not, means bark of jungle bark other than *Cinnamomum Zeylanicum*, but saturated in a decoction of cinnamom chips. The statistical position of quilled bark being good, present prices ought to be maintained at the February sales unless there is a rush of spice into the London Market within the next few weeks. The following is the Report on the sale of the well-known firm of Messrs. Forbes, Forbes & Co., Ltd.:—

London, E.C., 26th Nov. 1901.

CINNAMON.—The last auction for this year were held yesterday with an offering of 1,690 bales plantation quill, compared with 834 bales in August last and 1,687 August period last year.

The "unworked" spice comprised 1,399 bales and "worked" quill 291 bales.

With a good attendance of buyers there was improved competition, the 291 bales "worked" being sold, firsts, seconds and thirds of the finer grades at about 1½d average per lb advance. Fourths and lower qualities being steady.

Of the "unworked" 1,212 bales sold, medium and common sorts at about ½d per lb average decline.

"Worked" firsts range from 11½d to 1/8 per lb seconds 10½d at 1/6, thirds 9½d to 1/5 and fourths 8d at 10½d per lb.

"Unworked" firsts 8½d at 11d, seconds 8d at 10½d, thirds 7½d at 9d and fourths 7d at 9s per lb.

Of 762 packages quillings, &c., and chips about 200 were cleared the former at 7d at 10d and the latter at 3¼d at 3½d per lb.

"WILD" Cinnamon, 207 bales and 56 bags were quite neglected.

Stocks of Plantation		2,291	bales against	3,032	bales
Do	Chips	3,154	do	2,743	do
Do	Wild	2,408	do	2,446	do
Do	Bark & Chips	7,891	do	7,460	do

The next sales will be held, 24th Feb. 1902.

TO THE PLANTING WORLD.

Seeds & Plants of Commercial Products.

Hevea Brasiliensis.—Orders being booked for the coming crop August-September delivery 1902, booking necessary before the end of April, quantities of 100,000 and over at special low rates. Plants available all the year round, 100,000 and over at special low rates. A leading Rubber planter in Sumatra, who purchased 50,000 seeds in 1899, and 100,000 in 1900, writes us, under date 15th November, 1900 :—"I received your letter of 20th October, from which I learn that you added another case of 5,000 seeds to replace the loss, &c. I am satisfied hereby, and even after this adding I am satisfied by the whole delivery of this year." Special offer, post free on application.

Castilloa Elastica.—True superior variety cultivated in Mexico, seeds from specially reserved old untapped trees. Orders booked for August-September delivery 1902, immediate booking necessary; large quantities on special terms; Plants in Wardian cases.

A foreign firm of Planters writes under date 11th October, 1901 :—"We beg to enquire whether you would procure us 100,000 Castilloa seeds, in which month we might expect them, and what would be the average price." Special offer, post free on application.

Manihot Glaziovii.—Seeds and Plants available all the year round, 100,000 and over at special low rates. A Mexican planter in sending an order for this seed wrote on the 22nd August, 1900 :—"If they arrive fresh and germinate easily I may send you larger orders, as they are for high ground where the Castilloa does not thrive."

Ficus Elastica.—Seeds available in May-June; booking necessary before the end of March; also plants.

Mimusops Globosa (Balata) wood of the tree is much sought for buildings, fruits sweet like a plum and eaten, oil from seeds, said to yield as much as 45 lbs. of dry rubber per tree per annum, the milk is drunk and when diluted with water used as cow s milk, grow from sea-level up to 2,000 feet, orders being booked for seeds and plants, price on application.

Cinnamomum Zeylanicum (Cinnamon superior variety).—New crop of seed in April to June; booking necessary before the end of February; also plants.

Coffee Arabica, Liberian Hybrid and **Maragogopie Hybrid.**—New crop March-April; immediate booking necessary.

A foreign Agricultural Department writes dating 9th September, 1901 :—"Please accept our order for 175 lbs. of Tea seed and for 2,000 Coffee beans. In regard to Coffee seed I would say that this will be the first importation made by this department, and we will leave the selection of the varieties to be sent to your judgment."

OUR DESCRIPTIVE PRICE LISTS.

The following six Descriptive Price Lists are now being forwarded with Circulars and special offer, of Seeds and Plants of Rubber and other Economic Products :—

1. Tropical Seeds and Plants of Commercial Products, enlarged edition for 1902.
2. Seeds and Plants of Shade, Timber, Wind-Belts, Fuel, and Ornamental Trees, Trees for Roads sides, Parks, Open Spaces, Pasture Lands, Avenues, Hedges, and for planting among crops (Tea, Coffee Cacao, Cardamoms, &c.)
3. Seeds and Plants of Tropical Fruit Trees including Mango grafts.
4. Bulbs, Tubers and Yams.
5. Orchids—Ceylon and Indian.
6. Seeds and Plants of Palms, Calamus, Pandanus, Cycads, Tree and other Ferns, Crotons, Roses, Dracinas, Shrubs and Creepers.

Special Arrangements made with foreign Governments, Botanical and Agricultural Departments, Planters and others for supplying seeds and plants of Commercial Products in large quantities.

"SOUTH AFRICA."—The great authority on South African affairs of 25th March, 1899, says:—"An interesting Catalogue reaches us from the East. It is issued by WILLIAM BROTHERS, Tropical Seed Merchants of Henaratgoda, Ceylon, and schedules all the useful and beautiful plants which will thrive in tropical and semi-tropical regions. We fancy Messrs. Williams should do good business, for now that the great Powers have grabbed all the waste places of the earth, they must turn to and prove that they were worth the grabbling. We recommend the great Powers and Concessionaries under them to go to William Brothers."

Agents in London :—MESSRS. P. W. WOOLLEY & Co., 90, Lower Thames Street.

Agent in Colombo, Ceylon :—E. B. CREASY, Esq.

Agent in British Central Africa :—T. H. LLOYD, Esq., Blantyre.

Telegraphic Address :
WILLIAM, HENARATGODA, CEYLON.
Lieber's, A.I. and A.B.C. Codes used.

J. P. WILLIAM & BROTHERS,
Tropical Seed Merchants,
HENARATGODA, CEYLON.

THE FOOD VALUE OF VEGETABLES.

Tomatoes rouse torpid liver and do the work, ordinarily of a doctor's prescription.

Lettuce has a soothing quieting effect upon the nerves, and is an insomnia remedy.

Celery is an acknowledged nerve tonic, and is more and more used in medicinal prescriptions.

Onions are also a tonic for the nerves, but people will be forever prejudiced because of their odour.

Potatoes should be eschewed by those who "have a horror of getting fat," as that is one penalty of eating them.

Parsnips, it is now contended by scientists, possess almost the same virtues that are claimed for sarsaparilla.

Beets are fattening, and even a moderately-learned man will understand that it is because of the sugar they contain.

Ordinary Lima beans, some one has said, are good to allay thirst, but the same can be said, with equal truth, of a pitcher of water.

Asparagus is efficacious in kidney ailments to an extent that it is not yet, perhaps, thoroughly appreciated.

Cucumbers, aside from sunbeam emitting properties known to readers of facetious paragraphs, contains an acid that is helpful in some cases of dyspepsia.

Parsley will assist good digestion, like cheese and nuts, but a quantity in excess of ordinary capacity has to be consumed. There in lies the joke.

Pumpkins are an ingredient in a patent medicine that is guaranteed to cure quite a variety of ailments flesh is heir to, but the world is increasing in inhabitants who do not believe all they hear. —E. N NOYES, in "What to Eat," in the *Queensland Agricultural Journal* for November.

BANANA CULTIVATION IN ZANZIBAR.

The cost of planting will depend upon circumstances. This year 6,165 bananas have been planted at Dunga in a young clove plantation at a cost of R74-15-3 which is at the rate of about 17 annas per 100. Three gangs of prisoners were, for the most part, employed at this work: one gang of four digging up the suckers, another of four carrying them to their destinations, and a third gang of four digging the holes and planting. 367 men planted 6,165 bananas which is at the rate of 16·8 per man per day. Prison labour is of course cheaper than ordinary labour even, when, as in this case, the wages of the police in charge are taken into account. Had ordinary labour been exclusively employed the cost would have amounted to within a fraction of one pice per plant, which is at the rate of 25 annas per 100. Thus the cost of prison labour compares in this instance with the cost of ordinary labour in the proportion of 2 to 3, assuming that a paid labourer would have done no more work in a day than a prisoner; not an altogether fair assumption.

The above calculation refers to planting in among young trees. Clearing and lining operations were dispensed with as these had already been performed for the young clove plants.

At Dunga suckers were obtained within half a mile of the spot. When plants have to be fetched from any great distance the cost of planting will be proportionally increased.

In two years time a clump of bananas will, if the suckers are not pruned away, present the appearance of a miniature forest, while the bunches of fruit will be light and of little value. At most half a dozen stems should be permitted to grow in one clump, the rest stubbed out. From time to time the earth may be hilled up round the stems, to invigorate the growth, and the dead leaves and stems cleared away to admit of air.

Returns.—The same proportion is not maintained in the money value returned. A plantation of 1,600 trees (clumps) planted at Dunga in 1898 to shade cocoa and kola has yielded during the last 12 months about two annas per tree. At the rate of 193 plants per acre (15 by 15) this amounts to about R24 per acre. The cost of gathering the fruit and selling it in the local market may be set down at, approximately, R8 per acre; leaving a net return of R16 per acre. Coconuts return from R14 to R17 per acre. Both are subject to theft and in neither case has the cost of cultivation been taken into account. There is this difference, however, between the two products: coconut trees will get along without cultivation, bananas will not. The cost of cultivation in the case of the trees referred to above, would amount to not less than R12 per acre, which, if charged to the bananas, would leave a margin of profit too narrow to permit of their being cultivated. As however they have been grown especially to shade the experimental plots of cocoa and kola the proceeds of their produce may be counted as profit. Considerable loss takes place through theft and in order to reduce this loss as much as possible the fruit is often cut sooner than it otherwise would be. But when so cut the bunches command a lower price in the market than if they had been allowed to remain till they had matured. The bunches are cut green and buried in a hole in the earth which has been previously heated with fire. In four or five days they will be ripe and ready for eating. Or they may be hung up to ripen, in which case the process will occupy ten or twelve days. The trunk is always cut down when the fruit is cropped as it will not bear a second time.

Bananas bear in about 12 months from planting, a month or two less if the suckers were large when planted and the season favourable. They bear all the year round, that is to say there are always bunches coming in.—*Shamba*, Nov. 6.

INDIAN TEA TRADE.

The following letter from Mr George Seton, of 120, Bishopsgate Street, E.C, appears in today's *Standard* in reply to a long and rather belated article:—

"My attention has been called to an article in the *Standard* on Monday last, headed 'The Indian Tea Trade: A Gloomy Outlook,' which article (and more particularly its heading) seems likely to cause some misapprehension—hardly justifiable from the facts of the case. As indicated in the report on the tea trade of India, which you quote, the Indian tea planting industry has lately passed through something in the nature of a crisis. Owing to the great stimulus given to tea-planting by the fall in the value of the rupee and other causes, very large extensions of cultivation were made, not only prior to but even after the closing of the Indian Mints to the free coinage of silver, with the result—as shown by you—that a very great fall took place in the price of all teas. The decline reached a climax in 1900, and in the earlier part of the present year, when the full stream of overproduction, both from India and Ceylon, surged upon a surfeited market. Since then, however—thank

partly to the self-restraint of planters, who curtailed production by a finer system of plucking, and partly to the hand of Nature (which, after two successive years of abnormal fertility, stayed production in a great measure)—a complete change has supervened, and supplies for the present season seem unlikely to do more than barely meet the consumption. So far only the prices of the lower grades of tea have responded materially to the improved conditions, but now that the shortage of supply—especially from the Indian plantations—is becoming an accomplished fact, it is fully expected that a higher range of prices will prevail. I do not wish to assert that we are yet altogether 'out of the wood'; indeed, I believe that planters may, for some time yet, have to strain every nerve to reduce cost of production, and utilise every device for attaining greater efficiency in the management of their plantations. But the outlook cannot exactly be said to be as gloomy, as it has been during the last three years. On the contrary, I believe we are just beginning to see a little daylight ahead, and that your correspondent's article ought rather to have borne the device 'a gloomy past.' Considerable efforts are now being made to foster and extend new markets—as is, indeed, pointed out by your correspondent—and this with a fair measure of success; but I admit still greater efforts are yet wanted in this direction. One point further only will I refer to, which is the allegation that planters in 1900 'picked the tea more closely, and so increased the output—thus intensifying the evil.' They were only prompted to do so (unwisely, I admit) owing to the extraordinary and unexpected rise which took place during 1899, when, owing to the peculiar position of the market, the veriest rubbish of tea (*i e*, the coarsest grades) commanded as good a price as those of a much higher standard, which sta e of affairs continued up to well on in the Spring of 1900."—*H & C Mail*, Dec. 13.

MICA.

A meeting of the Optical Society was held on November 28th at the Technical Institute, Leonard Street E.C. The President (Mr Dixey) was in the chair, and after the routine business has been disposed of he called on Professor Silvanus P Thompson to give a lecture on

MICA.

The resources of the Institute enabled the lecture to be experimentally illustrated, and it was further made attractive by a collection of the various kinds of mica' lent for the occasion by Messrs. Wiggins. Professor Thompson began by describing the uses of mica, it being used most extensively for lamp-chimneys and oven-windows, and for insulating-purposes. Mica is often miscalled talc, which is a substance possessing very different properties. The following table shows the chief varieties of mica, and the differences in optical properties:—

—	Sp. Gr.	—	Angle	Index of Refraction
Muscovite	2·7-2·9	Biaxial	55°-75°	1·56-1·67
Phlogopite	2·72	Biaxial	7°-18°	1·75-1·73
Biotite	2·7-3·1	Uniaxial	0° or nearly	
Lepidomelane	2·9-·31	Uniaxial & Biaxial	—	
Zinnwaldite	2·9	Biaxial	50°-67°	
Lepidolite	2·8	Biaxial & Uniaxial	76°-86° 0°	

Mica is a complex silicate commonly containing aluminium, sodium, potash, and magnesium. Lepidolite contains a good deal of lithium, easily demonstrated by holding a piece in the flame, whilst lepidomelane, a black mica, contains much iron. Muscovite, the commonest kind, known in the middle ages as "muscovy glass," is found in Russia; the other kinds coming from the United States, India, and Australia. The colour of mica varies according to its composition, and is also altered by "inclusions" some specimens shown being coloured by inclusions of thin plates of garnet and tourmaline. Crystals of mica belong to the monoclinic system, although they appear to be hexagonal. The characteristic of mica is its cleavage into flexible layers. Large blocks of mica are opaque, but, curiously enough, are quite transparent in the edge direction. Among the properties of mica are to be noted asterism, or the star-shaped figures which show on viewing some kinds of mica by transmitted light. A phenomenon of star-shaped figures (*schlagfigur*) is also produced on striking a plate of mica, the figure resulting varying with the kind of mica. On splitting and bending some kinds of mica flashes of light are seen, due to electrical disturbances. The optical properties of mica were shown in the tourmaline forceps, and by means of a polarising microscope adapted to the optical lantern. The optic axes were by this contrivance shown to vary, those in which the angle between the axes is very small being called uniaxial. The axes, as seen in the polariser, have the appearance of an eye, and are called "houppes." Professor Thompson pointed out that even when plates of mica are revolved before a strong light "houppes" are seen, this being a phenomenon that has not been previously pointed out. An artificial mica much used for insulating-purposes is made from waste pieces of mica by mixing with shellac and baking the plates under pressure.

Votes of thanks concluded the meeting.—*Chemist and Druggist*, Dec. 7.

PRODUCE AND PLANTING.

THE DELINQUENCIES OF THE TEA GROWER seem to supply inexhaustible material for criticism. Between those good-natured friends who have theories upon the subject of tea planting, tea makeing, the labour question, and all kindred matters connected with tea garden life and work, and others who are always ready to come down heavily upon those who cannot command success all the year round, the tea industry in its adversity has suffered much of late. We print in another column a communication on the Indian tea trade which appeared in the *Financial Times* on Friday last from a Calcutta correspondent of that Journal. It is not pleasant communication, and the shareholders in tea companies, for whom we imagine it was primarily intended, might reasonably think that not only had the Indian tea industry gone, to use the language of Mr Mantalini, to the "demnition bow-vows," but that the majority of tea growers, directors, and managing agents of tea property, together with the Tea Associations, were grossly incapable people, deaf to the good advice showered on them from all sides, and deserving of punishment which should include "something lingering, with boiling oil in it." Only two people come out of the business triumphant, and conscious that they have done their duty. These are the far-seeing writer in the financial paper, to whom reference is made, and the correspondent himself. One, or perhaps both of them, scenting destruction coming full speed ahead upon the tea industry five years ago, and divining that unless new markets, &c., were found at once, the position would go from bad to worse, are now in the Olympian position of being able to say, "I to d you so,"

Planters ignored advice and rejected prophecy. Now, therefore, every self-respecting seer washes his hands on the tea industry, and says, "It serves you right." This is perhaps a free translation of the Calcutta communication to the *Financial Times*, but it is the inference to be drawn from it. Effusions of this kind are wearisome. Criticism directed against the policy of companies whose directors may have laid themselves open to it is understandable, but a sweeping condemnation of growers, tea agency firms, and everyone connected with tea, because profits have fallen away, is puerile. Mistakes have been made in the tea industry, and planters are quite aware of the fact. The sum of the tea growers' offence (brought to his notice pretty often of late, and the blame is distributed evenly between India and Ceylon) includes in its main items reckless extension of cultivation, an unwise glutting of the market with tea, and the pursuance of a policy known as that of "the devil take the hindmost," as evidenced in the days of their prosperity by neglect of wider outlets for the ever-increasing supply of tea. And then worst of all, some of them yielding to the wiles of the company-promoting fraternity, were tempted into the paths which lead to over capitalisation, to the detriment of the entire tea industry and the eclipse of its good name with the investing public. And in addition, the Fates have been unkind, and the Chancellor of the Exchequer has been very inconsiderate.

No sooner, therefore, did dividends diminish than the storm of criticism broke. The tea grower, who in prosperous times had been regarded as the pink of commercial enterprise and the acme of astuteness in the management of his own affairs, was sniffed at in all directions. His enormities were catalogued, and the past, present, and future of the tea industry were the subject of bitter comment in the Press. Having received this baptism of fire, the planter, anxious to right himself and smarting under the injustice of many of these tirades, begins to feel that not only is the critical process overdone, but in the interest of the industry itself it is time there was a lull. He has had enough both of criticism and good advice and has no further use for either at present, while a rehash of the old indictment, with the suggestion that he goes on planting tea and committing other offences out of "pure cussedness," is irritating. But to reproach garden proprietors with indifference to new outlets for their produce is the last straw. If there be one subject which the planter has learned to accept as the fixed rule of his life for years past, it is that he must at all costs find new markets for his tea. This doctrine has been preached to him in blue books, shouted into his ear in public and in private, wired to him, written to him, and in his festive moments it has disturbed his peace of mind, and almost forced him to use strong language. As a consequence, he may be said to have gone "baldheaded" for new markets, and that indifference about the matter should now be urged against him is too much. As to the question why he has not cultivated other products, he probably has an effective reply, although his critics endeavour to maintain that in this respect he has not lived up to his chances. These same critics think he might have grown sugar or fibre products, and a dozen other things, or searched for gold, and in fact, readily played the part of Jack of all trades, in addition to growing tea and studying how to do this well. The modern tea planter should, in their opinion, be a kind of Admirable Crichton with commercial instincts and a dash of the J Pierpont Morgan about him. No doubt a great deal of the criticism of the tea producer is meant mainly for the eye of the shareholder. But it may be doubted if shareholders in Tea Companies desire to hear the story of the past dished up again and again. Like the growers, they are waiting and hoping for better times, and it does not inspire confidence in the future to be wrongly told that the majority of the men who control their interests lack "common business capacity," and that the Tea Associations are no wiser. Whether good times come or not, all connected with the tea industry have had an ample opportunity of testing the uses of adversity, and it is not a fascinating method of pointing a moral to recall warnings issued five years ago either at first or second-hand. The planter will, we trust, be able to work out his own commercial salvation, and whether he succeeds or fails, neither he nor anyone else connected with him will profit anything by frequent croaking that "all is lost."

Referring to

TEA GROWING

in the United States, "Tea, Coffee and Sugar," of New York, says: "It having been shown that tea can be grown in South Carolina, it follows that with the same attention it may be produced over a wide area of the United States. Already the experimenters, as is usual in the importation of new industries or processes into the United States, have adopted a number of improvements over the Old World methods in the growing and handling of the plant and its product, and it may not be impossible that in the future we may find ourselves selling tea in China. But, however this may be, tea growing gives every promise of becoming an important industry, and its introduction is one of the many evidences of the value to the country of an intelligent and energetic administration of the Department of Agriculture." It would be interesting to learn something about the new methods here referred to. If the experimental growers of tea have improved upon Indian and Ceylon methods we shall be surprised.

In Hayti the

COFFEE GROWER

is not a free agent in the disposal of his produce. According to a Consular report, a planter is prohibited by law from dealing direct with the exporters, and must, therefore, have recourse to the "Haytian speculator," whose charges are very high. In Hayti there is an export duty on coffee of 3 86 2-3dols. per 100 lb. (18s per cwt.) It is not surprising, then, concludes the Consul, that the cultivation of cacao tends to be substituted for that of coffee, although the coffee plantations cover an area of 50,000 hectares (123,500 acres).

In her interesting book entitled 'Mexico as I saw It,' recently published, Mrs Alec Tweedie mentions that during a fatiguing journey in Mexico she was served, after a meal, with

ORANGE TEA

(Hojas de Narango), made from the fresh young leaves of the orange tree, infused in the same way as ordinary tea. She refers to its invigorating and refreshing qualities.—*H. and C. Mail*, Dec. 13.

THE EAST INDIA AND CEYLON TEA CO., LIMITED

SHAREHOLDERS' COMMITTEE WORK REVIEWED.

At last has the worm turned? Is the redoubtable, pious, artful, and wealthy Sir John Muir really to be called to account? We almost begin to hope, for here is a report by a committee of shareholders in a "Finlay-Muir Company," endowed with all the usual characteristics and barnacles, actually

PROPOSING THAT SHAREHOLDERS SHOULD MAKE THE MANAGEMENT

into their own hands. They have excellent grounds for this proposal in the facts that they succeeded in unearthing, although the overbearing or overshadowing Glasgow house

effectually barred the way to information about the Hopewell Tea Company, through the promotion of which this India and Ceylon Company has been nearly ruined. Its own history is bad enough. Beginning in 1896 with a profit of £12,657 it ended in November, 1900, with a loss of £2 911, and between these dates profits bobbed up and down like corks in a toy fountain. Prices for tea and rupees had something to do with the decline in profits, but agency and working charges more, and, in fact, these charges have had a good deal to do with the determination of some independent shareholders to get at the bottom of things. They do not seem to relish the idea of existing merely for the glory and gains of Sir John Muir and his doughty retainers.

This committee has found that during the existence of the company the amount paid in commission alone to Messrs P R Buchanan & Co., the agents in London, and Messrs Finlay, Muir & Co., the agent in Calcutta and Colombo, amounted to £11,141 or over 4¾ per cent on the gross proceeds of all the tea sold. It rightly says that this percentage is excessive and out of all proportion to the results attained. But has it really got to the bottom of these charges with this statement? We note, for instance, that "a new tea house" was to be erected on the Mookham Estate, and that a variety of materials was forwarded for this purpose, although it was not carried out. Some of the articles were disposed of at cost, but "the girders and pillars still remain unused on the ground." What we should like to ask is, Was no commission received by the agents upon these purchases, apart from that paid by the tea company? No insinuation is made; we only ask the question because of facts that have come to our knowledge in other directions. Why was the tea house ordered? The Calcutta and Colombo charges are very heavy, says the committee, and apparently the company's agents have recognised this by handing back a trifle of money, just to prevent friction, we suppose. In illustration we are told that the customary and

PROPER CHARGES FOR SHIPPING TEA IN COLOMBO,

including harbour dues, is "one-half rupee cent" per lb (does this mean per cent ?), whereas Messrs. Finlay, Muir & Co. are in the habit of charging "three-quarters rupee cent" per lb exclusive of harbour dues. When this was brought to the notice of the great house it refunded £165 3s 4d for 1900, being the amount of the harbour dues, but on condition that the company paid the visiting agents' fees for inspecting the estates. This is thoroughly "Muirish," and exquisite in its way. But the accounts for the year 1898 and 1899 showed harbour dues and cartage amounting respectively to £315 and £347, and these sums do not seem to have been handed back, while the accounts for the preceding two years "cannot be found" at all any more. The committee thinks that Messrs. Finlay, Muir & Co., should be "approached" by the directors, that is to say by the nominees of the said Finlay, Muir & Co. to see whether these moneys could not also be handed back. It is very meek of it, in its place we should be inclined to try the Court of Session.

One of the most curious revelations in this fascinating report is the story of what the Scotch would call the

"INTROMISSIONS" OF THE ANGLO-AMERICAN DIRECT TEA TRADING CO., LIMITED,

another of the Finlay-Muir corporations, as handy agent in the commission-earning line. It seems that the Anglo-American Company is one of the East India and Ceylon Company's best customers, and that the tea it buys is shipped direct to the United States *via* Hong Kong. It consequently never comes to London at all, and is in no way subject to London charges; nevertheless, the London agents take the commission on the sales, and have done very handsomely by the business. This portion of the report had, we think, best be given in the investigating committee's own words, together with the results. It is a most interesting and curious revelation.

The prices for the tea so sent are fixed by the London agents' tea-man with the assistance of an independent broker after valuing samples sent to London. A calculation seems to have been made on each consignment of the amount of freight, insurance, warehouses charges and sale expenses which would have been incurred if the tea had been sent to London, and the amount so ascertained has from time to time been allowed to the Anglo-American Direct Tea Trading Company; but Messrs. P R Buchanan & Co., the London agents, have charged in their accounts against the company full commission on the gross amount of the tea sold before making any such allowances, as if such tea had actually passed through their hands and been sold in London.

	£	s.	d.		£	s.	d.
				was allowed on			
In 1896	769	16	3	sales amounting to	11,559	5	9
1897	986	16	10	" " "	12,278	11	4
1898	1,092	18	9	" " "	12,334	19	0
1899	1,085	4	6	" " "	15,910	17	3
1900	1,056	6	1	" " "	12,743	17	9
	£4,991	2	5		£64,827	11	1

Then the

HOPEWELL TEA COMPANY COMES UNDER REVIEW.

It also is a product of the fertile commission-distilling energy of Sir John Muir and his associates. This company bought some of the East India and Ceylon Company's land, but did not pay for it in cash. On the contrary, the East India and Ceylon Company had to take payment in shares, and to subscribe also for further shares, and part of these shares carried a liability of £67,000, of which £63,300 has been called up, thus stripping the vendor company of money instead of strengthening its resources. And the Hopewell Company seems to be so completely in the hands of Finlay Muir & Co., that no accounts at all are issued, nor have any shares been allowed to get into independent hands, so that the all-sucking Glasgow firm just piously smiles at those who want to know things. All insight into the accounts has been refused to this committee, which declares that its report has been "greatly delayed" by the difficulty in obtaining information. It has, however, found out that a loss of nearly £22,000 has been incurred by the Hopewell enterprise, although how is not revealed, and it also seems to have unearthed the fact that a circular letter issued by Messrs. P R Buchanan & Co., London agents, to the shareholders of the East India and Ceylon Company, accompany a prospectus soliciting subscriptions for Hopewell shares, made a statement not at the time true. The statement was to the effect that the directors had at that date entered into an agrement to form to Hopewell Tea Company, a copy of which agreement, the circular stated, could be seen at the office of the East India and Ceylon Company, and the terms of which agreement it went on to recite. There was

no signed agreement in existence at that date, the committee declares, the said date being July 23rd, 1897. On August 6th and 17th in the same year, after the shares had been allotted in the manner set forth in the circular, an agreement was executed but apparently not considered sufficient, for on December 14th and 15th following another agreement was entered into which introduced modifications upon the previous one and imposed new terms and conditions. In this latter document Messrs Finlay, Muir, and Co. were appointed expressly, and without any reservation, managing agents of the Hopewell Company and Messrs P R Buchanan and Co., the London agents, while Messrs J Finlay and Co., of Glasgow, were made secretaries. No shareholders' meeting was called to sanction any of these agreements. To all appearance there

NEVER HAS BEEN A REAL SHAREHOLDERS' MEETING

of the Hopewell Tea Company. It does not seem necessary to call one. Messrs Finlay, Muir, and Co. merely use the name in their commission business, and the shareholders in the victimised companies find the losses, a most excellent arrangement for sweet Sir John while it lasts. We have read this report with great interest, and trust it is the beginning of many things not least of reforms in the method of handling the affairs of the Finlay-Muir group of companies, a method that we have again and again done our best to present in its true light as a scandal and a disgrace to the business community. The morality of Scotch merchants and bankers must have fallen very low indeed if this sort of thing is to continue to be looked upon with indulgent benevolence, and "prayerfully" tolerated.—A notice has been issued by the board of the East India and Ceylon Tea Company, calling

"AN EXTRAORDINARY GENERAL MEETING."

at the close of the adjourned general meeting, to be held on the 17th instant, at 12 noon, in River Plate House, Finsbury-circus. Accompanying the notice is a circular drawn up in rebuttal of the committee's charges, and a very lame performance it proves to be. The gravest allegations of all those relating to the formation of the Hopewell Company are ignored, as also the story of the Anglo-American Direct Tea commissions. In a word, the circular seems to us little better than derisory, and if there are any public-spirited men among the shareholders they ought to do their utmost to change the entire management, board and all. Unfortunately, the date of the meeting leaves them little time, and they may count upon obstruction of the cunningest sort when it is held. But for all that they should be up and doing.—*Investor's Review*, Dec. 14.

TROUT AT THE DARGLE, NATAL.—Mr C W Methven's total bag for four days' fishing was 41 trout, the average weight being 1lb. 3 oz each. In addition to this large catch, there have been many baskets of 20 and 30 made since the opening of the season—amply justifying the belief that a big future is in store for the Natal trout-fishing grounds.—*Natal Mercury*, Dec. 9.

THE DEAF HEAR.—No. 479 of *the Illustrated World* of 626, Chiswick High Road, London, W., England contains a description of a remarkable Cure for Deafness and Head Noises which may be carried out at the patient's home, and which is said to be a certain cure. This number will be sent free to any deaf persons sending their address to the Editor.

COLOMBO PRICE CURRENT.

(Furnished by the Chamber of Commerce.)

EXPORTS

Colombo, Dec 31st, 1901.

CARDAMOMS :—
All round parcel, well bleached per lb. R1·55
Do. dull medium do. R1·40
Special assortment, 0 and 1 only do. R1·90
Seeds do. R1·40

CINCHONA BARK :—
Per unit of Sulphate of Quinine 8c—1½ to 3 o/o

CINNAMON :—
Ordinary assortment per lb. 53c.
Nos. 1 and 2 only per lb. 59c,
Nos. 3 and 4 only per lb. 48c.

CINNAMON CHIPS :—
Per candy of 560 lb R75·00

COCOA :—
Finest estate red; unpicked per cwt R48·00
Medium do do do R43·00
Bright native unpicked and undried R40 00
Ordinary do do do R36·00

COCONUTS—(husked).
Selected per thousand R58·00
Ordinary ,, R48·00
Smalls ,, R39·00

COCONUT CAKE—
Poonac in robins f. o. b. per ton R75·00
Do in bags None

COCONUT (Desiccated).
Assorted all grades per lb 20c

COCONUT OIL—
Dealers' Oil per cwt R20 00.—Nominal.
Coconut Oil in ordinary packages f. o. b. per ton R437·50.—Business done February, March and April R425 Nominal.

COFFEE.—
Plantation Estate Parchment on the spot per bus. None.
Plantation Estate Coffee f.o.b. (ready) per cwt — None.
Native Coffee, f.o.b per cwt.—None.

CITRONELLA OIL—
Ready do per lb.—46c

COPRA—
Boat Copra per candy of 560 lb. R62 50
Calpentyn Copra do do R62·50
Cart do do do R59·00
Estate do do do R62·50

CROTON SEED per cwt—R15·00

EBONY—
Sound per ton at Govt. depot—R190.00 Sale of the 2nd instant.
Inferior R125·00 Sale of the 2nd instant.

FIBRES—
Coconut Bristle No 1 per cwt R11·50
Do ,, 2 ,, None
Do mattress ,, 1 ,, 3·50
Do ,, 2 ,, 2 00
Coir Yarn, Kogalla ,, 1 to 8 14·75
Do Colombo ,, 1 to 8 11·25
Kitool all sizes ,, None
Palmyrah ,, None

PEPPER—Black per lb None

PLUMBAGO—
Large lumps per ton R500
Ordinary lumps do R500
Chips do R350 Fine qualities scarce.
Dust do R180
Do (Flying) do R100

SAPANWOOD— per ton None.

SATINWOOD (ordinary) per cub'c ft. R2·75 Sale of the 5th instant.
Do do per cubic ft. None.

TEA—	High Grown Average.	Medium Average.	Low Grown Average.
Broken Pekoe and Broken	cts	cts	cts
Orange Pekoe per lb	..	..	.. No sale
Orange Pekoe do	..	..	..
Pekoe do	..	..	..
Pekoe Souchong do	..	..	..
Pekoe Fannings do	..	..	..
Broken mixed—dust, &c	..	..	..

SHARE LIST.

ISSUED BY THE

COLOMBO SHARE BROKERS' ASSOCIATION.

CEYLON PRODUCE COMPANIES.

Company	paid p. sh.	Buyers.	Sellers.	Transaction.
Agra Ouvah Estates Co., Ltd.	500	875	900	890
Ceylon Tea and Coconut Estates	500	—	—	—
Castlereagh Tea Co., Ltd.	100	—	...	75
Ceylon Provincial Estates Co. Ltd.	500	510	—	500 XD
Claremont Estates Co., Ltd.	100	—	—	—
Clunes Tea Co., Ltd.	100	—	50	—
Clyde Estates Co., Ltd.	100	—	—	..
Doomoo Tea Co., of Ceylon Ltd.	100	65	—	—
Drayton Estate Co., Ltd.	100	...	...	...
Ella Tea Co., of Ceylon, Ltd.	100	—	30	—
Estates Co of Uva, Ltd.	500	200	210	—
Gangawa	100	—	—	..
Glasgow Estate Co., Ltd.	500	—	950	950
Great Western Tea Co., Ltd.	500	610	—	—
Hapugahalande Tea Estate Co.	200	—	—	..
High Forests Estates Co., Ltd	500	...	550	..
Do part paid	400	—	450	—
Horeckelly Estates Co Ltd	100	—	85	—
Kalutara Co., Ltd.,	500	—	250	—
Kandyan Hills Co., Ltd.	100	...	40	...
Kanapediwatte Ltd.	100	..	85	...
Kelani Tea Garden Co., Ltd.	100	..	..	..
Kirkleess Estate Co., Ltd.	100	...	120	..
Knavesmire Estates Co., Ltd.	100	..	55	...
Maha Uva Estates Co., Ltd.	500	...	350	..
Mocha Tea Co., of Ceylon, Ltd.	500	—	700	..
Nahavilla Estate Co., Ltd.	500	...	300	..
Neboda Tea Co., Ltd.	500	..	500	...
Palmerston Tea Co., Ltd.	500	...	400	—
Penrhos Estates Co., Ltd.	100	...	90	...
Pitakanda Tea Company	500	...	...	..
Pine Hill Estate Co., Ltd.	60	35	40	..
Putupaula Tea Co., Ltd.	100	...	..	..
Ratwatte Cocoa Co., Ltd	500	..	250	...
Rayigam Tea Co., Ltd.	100	...	...	—
Roseberry Tea Co., Ltd	100	70	..	..
Ruanwella Tea Co., Ltd.	100	...	35	...
St, Hellier's Tea Co., Ltd,	500	...	500	...
Talgaswela Tea Co., Ltd.	100	...	27·50	...
Do per cent Prefs.	100	..	70	...
Tonacombe Estate Co,, Ltd,	500	..	...	...
Udugama Tea & Timber Co., Ltd.	50	...	...	...
Union Estate Co., Ltd.	500	..	125	...
Upper Maskeliya Estates Co. Ltd	500	...	425	...
Uvakellie Tea Co., of Ceylon, Ltd.,	100	65	...	..
Vogan Tea Co., Ltd.,	100	...	52·50	...
Wanarajah Tea Co., Ltd.	500	..	1000	...
Yataderiya Tea Co., Ltd.	100	..	275	..

CEYLON COMMERCIAL COMPANIES.

Company	paid p. sh.	Buyers.	Sellers.	Transaction.
Adam's Peak Hotel Co., Ltd.	100	...	30	—
Bristol Hotel Co., Ltd.	100	—	110	...
Do 7 per cent Debts	100	107	—	—
Ceylon Gen. Steam Navgtn. Co., Ltd	100	—	—	..
Ceylon Superaeration Ltd.	100	—	50	—
Colombo Apothecaries' Co. Ltd.	100	—	137·50	—
Colombo Assembly Rooms Co., Ltd.	20	15	..	...
Do prefs.	20	...	..	—
Colombo Fort Land and Building Co., Ltd.	100	—	85	—
Colombo Hotels Company	100	—	297½	—
Galle Face Hotel Co., Ltd.	100	—	—	180
Kandy Hotels Co., Ltd.	100	112½	—	...
Mount Lavinia Hotel Co., Ltd.	500	275	350	...
New Colombo Ice Co., Ltd.	100	..	175	172·50
Nuwara Eliya Hotels Co., Ltd.	30	27·50	—	...
Do 7 per cent prefs.	100	—	...	107
Public Hall Co., Ltd.	20	12½	14	—

LONDON COMPANIES.

Company	paid. p. sh.	Buyers.	Sellers.	Transaction
Alliance Tea Co., of Ceylon, Ltd.	10	..	8–9	...
Anglo-Ceylon General Estates Co	100	..	55–60	...
Associated Estates Co., of Ceylon	10	...	1½–2½	..
Do. 6 per cent prefs.	10	..	3–5	...
Ceylon Proprietary Co.	1	...	¼–½	—
Ceylon Tea Plantation Co., Ltd.	10	..	23¼ 24	..
Dimbula Valley Co., Ltd.	5	..	5–5½	—
Do prefs	5	—	5–6	—
Eastern Produce & Estates Co. Ltd.	5	3¼	3¼–3¾	...
Edeiapolla Tea Co., Ltd.	10	...	6–8	—
Imperial Tea Estates Co., Ltd.	10	4	4 4½	...
Kelani Valley Tea Assn., Ltd.	5	..	3–5	...
Kintyre Estates Co., Ltd.	10	..	6 8	...
Lanka Plantation Co., Ltd	10		4	3
Nahalma Estates Co.,Ltd.	1	–	nom	..
New Dimbula Co., Ltd.	1	...	2¾–3	..
Nuwara Eliya Tea Estate Co., Ld.	10	—	10	9¾
Ouvah Coffee Co., Ltd.	10	..	6–7	...
Ragalla Tea Estates Co., Ltd.	10	.	11–13	..
Scottish Ceylon Tea Co.,Ltd.	10	–	10–15	...
Spring Valley Tea Co., Ltd.	10	...	2–5	..
Standard Tea Co., Ltd.	6	..	10–12	...
The Shell Transport and Trading Company, Ltd.	1		2⅞–3¼	...
Uknwella Estates Co., Ltd.	25	—	par	..
Yatiyantota Ceylon Tea Co., Ltd.	10	—	5¼	—
Do. pref. 6 o/o	10	..	9–10	

BY ORDER OF THE COMMITTEE

Colombo, Jan. 10th, 1902.

* Latest London Prices.

RAINFALL RETURN FOR COLOMBO.

(*Supplied by the Surveyor-General.*)

	1897.	1898.	1899.	1900	Av of 31yrs.	1901	1902
	Inch	Inch	Inch.	Inch.	Inch.	Inch.	Inch
January ..	3·81	2·32	6·98	3·72	3·24	11·91	1·54*
February ..	1·68	1·98	2·78	0·63	1·89	3·55	
March ..	3·66	4·21	0·88	3·71	4·75	5·12	
April ..	10·97	22·81	6·66	15·12	11·43	8·71	
May ..	8·30	5·80	17·73	10·63	12·04	6·28	
June ..	10·14	10·94	9·23	7·83	8·35	5·93	
July	5·24	6·15	1·11	6·77	4·30	4·52	
August ..	9·09	0·97	0·62	7·35	3·79	0·46	
September	4·58	6·90	1·48	4·00	4·98	3·93	
October ..	4·71	20·60	12 99	9·47	14·36	3 91	
November..	11·66	17·38	8·58	9 25	12·55	19·84	
December..	8·89	3·05	4·44	5·2	6·35	1·70*	
Total..	82·73	103·11	73·48	83·68	88·03	75·86	1,54

* From 1st to 8th Jan. 1·54 inch, that is up to 9·30 a.m on the 9th Jan.—ED C.O.

COPRA IN FIJI.—Our Fiji correspondent states that tenders for the Government copra contract were opened on the 30th ultimo. Lever Brothers, Limited, Sydney, were the successful tenderers at £10 13s 5d per ton, which is considered a very satisfactory price.—*Sydney Mail*, Dec. 21.

RICE IN AUSTRALIA.—Rice grows to every, degree of perfection in the Port Douglas district and we ("Gazette") allude to the desirability of farmers including it among their products, and as instancing the possibilities here with that crop, we are enabled to inform our readers that one experimenter in Mackay this season realised over 10 tons of paddy from 10 acres of land selling the lot at £7 per ton on the wharf. The crop was harvested with the sickle, and doubtless a large quantity of the grain was lost, as rice sheds very freely. With up-to-date machinery in our favour, there is a lot in rice and it should be grown more abundantly in this district, which is equally adapted for it as Mackay.—*Sydney Mail*, Nov 30.

MARKET RATES FOR OLD AND NEW PRODUCTS.

(From Lewis & Peat's Fortnightly Price Current, London, November 27th, 1901.)

	QUALITY.	QUOTATIONS
ALOES, Soccotrine cwt.	Fair to fine dry	44s a [illegible]0s
Zanzibar & Hepatic ,,	Common to good	20s a 60s
ARROWROOT (Natal) lb.	Fair to fine	5½d a 6¾d
BEES' WAX, cwt.		
Zanzibar & Bombay { White ,,	Good to fine	£6 a £7 10s
Yellow ,,	Fair ,,	£6 a £6 12s 6d
Madagascar ,,	Dark to good palish	£6 2s 6d a £6 12s 6
CAMPHOR, Formosa ,,	Crude and semi refined	165s a 185s
Japan ,,	Fair average quality	175s a 18 s
CARDAMOMS, Malabar lb	Clipped, bold, bright, fine	2s 3d a 2s 4d
	Middling, stalky & lean	1s 5d a 1s 7d
Ceylon.—Mysore ,,	Fair to fine plump	1s 4d a [illegible]s
	Seeds	2s 2d a 2s 4d
,, Tellicherry ,,	Good to fine	2s 6d a 3s
	Brownish	1s 6d a 2s
,, Long ,,	Shelly to good	6d a 2s 6d
,, Mangalore ,,	Med brown to good bold	2s 3d a 3s 3d
CASTOR OIL, Calcutta ,,	1sts and 2nds	3¼d a 3½d
CHILLIES, Zanzibar cwt.	Dull to fine bright	35s a 45s
CINCHONA BARK.—lb. Ceylon	Ledgeriana Orig. Stem	3d a 5½d
	Crown, Renewed	5d a 7d
	Org. Stem	3¾d a 5½d
	Red Org. Stem	3⅜d a 4½d
	Renewed	3d a 5¾d
	Root	3¾d a 4d
CINNAMON, Ceylon per lb. 1sts	Ordinary to fine quill	9½d a 1s 6d
2nds	,, ,,	8½d a 1s 5d
3rds	,, ,,	[illegible]½d a 1s 4d
4ths	,, ,,	8d a 11d
Chips	,, ,,	2½d a 10d
CLOVES, Penang lb.	Dull to fine bright bold	4½d a 9½d
Amboyna ..	Dull to fine	5d a 6d
Zanzibar and Pemba }	Good and fine bright	4½d a 4¾d
	Common dull to fair	4¼d a 4⅜d
Stems ..	Fair	1⅝d
COFFEE Ceylon Plantation ,,	Bold to fine bold colory	92s 6d a 120s
	Middling to fine mid	80s a 10[illegible]s
	Low mid. and low grown	
	Smalls	40s a 60s
Native	Good ordinary	40s a 55s
Liberian ,,	Small to bold	3[illegible]s a 40s
COCOA, Ceylon ,	Bold to fine bold	67s 6d a 90s
	Medium and fair	60s a 66s
	Native	52s 6d a 62s 6d
COLOMBO ROOT ,,	Middling to good	7s a 15s
COIR ROPE, Ceylon ton		nominal
Cochin ,,	Ordinary to fair ..	£13 10s a £18
FIBRE, Brush ,	Ord. to fine long straight	£16 a £19
Cochin ,,	Ordinary to good clean	£20 a £24
Stuffing ,,	Common to fine	£7 a £9
COIR YARN, Ceylon ,,	Common to superior	£15 a £30
Cochin ,,	,, ,, very fine	£12 a £32
do. ,,	Roping, fair to good	£10 a £14 10s
CROTON SEEDS, sift. cwt.	Dull to fair	15s a 20s
CUTCH ,, ,,	Fair to fine dry	23s a 35s
GINGER, Bengal, rough ,,	Fair	40s
Calicut, Cut A ,,	Good to fine bold	9[illegible]s a 1[illegible]0d
B & C ,,	Small and medium	5[illegible]s a 80s
Cochin Rough ,,	Common to fine bold	45s a 52s
	Small and D's	42s 6d a 45s
Japan ,,	Unsplit	44s
GUM AMMONIACUM ,,	Sm. blocky to fine clean	15s a 45s
ANIMI, Zanzibar ,,	Picked fine pale in sorts	£10 7s 6d a £18
	Part yellow and mixed	£[illegible] a £8
	Bean and Pea size ditto	70s a £9 2s 6d
	Amber and dk. red bold	£5 10s a £6 7s 6d
	Med. & bold glassy sorts	80s a 100s
Madagascar ,,	Fair to good palish ...	£4 a £8
	,, ,, red ...	£4 5s a £9
ARABIC E. I. & Aden ,,	Ordinary to good pale	35s a 58s
Turkey sorts ,,		40s a 45s
Ghatti ,,	Pickings to fine pale ...	12s 6d a 35s
Kurrachee ,,	Good and fine pale ...	52s 6d a 55s
	Reddish to pale selected	30s a 40s
Madras ,,	Dark to fine pale ...	20s a 35s
ASSAFŒTIDA ,,	Clean fr to gd. almonds	60s a 137s 6d
	Ord. stony and blocky	6s a 25s
KINO ,,	Fine bright	1s 3d a 1s 6d
MYRRH, picked ,,	Fair to fine pale	90s a 115s
Aden sorts ,,	Middling to good	50s a 80s
OLIBANUM, drop ,,	Good to fine white	35s a 55s
	Middling to fair	25s a 35s
pickings ,,	Low to good pale	18s a 23s
siftings ,,	Slightly foul to fine	18s a 2[illegible]s
INDIARUBBER, Assam lb	Good to fine	2s a 2s 3d
	Common to foul & mxd.	7d a 1s 6d
Rangoon	Fair to good clean ...	2s a 2s 4d
Borneo	Common to fine	1s a 2s 3d

	QUALITY.	QUOTATIONS
INDIARUBBER (contd.)		
Java, Sing. & Penang lb	Foul to good clean ..	8d a 2s [illegible]d
Mozambique ,,	Good to fine Ball ...	2s 6d a 3s 1½d
	Ordinary to fair Ball ...	1s 10d a 2s 6d
	Low sandy Ball ...	1s 3d a 1s 7d
	Sausage, fair to good ..	2s 6d a 2s 11d
	Liver and Livery Ball ..	2s a [illegible]s
Nyassaland	Fair to fine ball ..	2s 2d a 2s 9¼d
Madagascar	Fr to fine pinky & white	2s 3d a 2s 6d
	Fair to good black ..	2s a 2s 6½d
	Niggers, low to fine .	7d a 1s 9d
INDIGO, E.I.	Bengal—	
	Shipping mid to gd violet	3s 8d a 4s 6d
	Consuming mid. to gd.	3s 2d a 3s 6d
	Ordinary to mid.	2s 10d a 3s 1d
	Mid. to good Kurpah	2s a 2s 6d
	Low to ordinary	1s 6d a 1s 10d
	Mid. to good Madra	2s a 2s 10d
MACE, Bombay & Penang per lb.	Pale reddish to fine	2s a 3s
	Ordinary to fair	1s 4d a 1s 11d
	Pickings	1s 3d a 1s 4d
MYRABOLANS, } cwt	Dark to fine pale UG	5s a 6s
Madras }	Fair Coast	4s 6d a 4s 9d
Bombay ,,	Jubblepore	5s a 6s
	Bhimlies	4s 3d a 7s
	Rhajpore, &c.	4s a 5s [illegible]d
Bengal ,,	Calcutta	3s 6d a 5s
NUTMEGS— lb.	64's to 57's	2s 4d a 2s 6d
Bombay & Penang ,,	110's to 65's	1s a 2s [illegible]½d
	160's to 130's	6d a 1s
NUTS, ARECA cwt.	Ordinary to fair fresh	[illegible]s a 56s
NUX VOMICA, Bombay	Ordinary to middling	4s a 5s 6d
per cwt. Madras	Fair to good bold fresh	7s a 10s 6d
	Small ordinary and fair	5s a 6s 9d
OIL OF ANISEED ,,	Fair merchantable	5s
CASSIA ,,	According to analysis	2s 9d a 3s
LEMONGRASS ,,	Good flavour & colour	5d a 5½d
NUTMEG ,,	Dingy to white	1½d a 3d
CINNAMON ,,	Ordinary to fair sweet	3¼d a 1s 6d
CITRONELLE ,,	Bright & good flavour	9½d a 10d
ORCHELLA WEED—cwt		
Ceylon ,,	Mid. to fine not woody..	[illegible]0s a 12s 6d
Zanzibar. ,,	Picked clean flat leaf ..	10s a 14s
	,, wiry Mozambique	10s a 11s
PEPPER—(Black) lb.		
Alleppee & Tellicherry	Fair to bold heavy ..	5⅞d a 6⅛d
Singapore .	Fair	6d
Acheen & W. C. Penang	Dull to fine	5¾d a 6⅛d
PLUMBAGO, lump cwt.	Fair to fine bright bold	30s a 35s
	Middling to good small	2[illegible]s a 32s
chips	Dull to fine bright ..	9s a 15s
dust	Ordinary to fine bright	3s 6d a 8s
SAFFLOWER	Good to fine pinky ..	65s a 75s
	Inferior to fair .	40s a 60s
SANDAL WOOD—		
Bombay, Logs ton.	Fair to fine flavour ..	£20 a £50
Chips ,,	... ...	5s a £8
Madras, Logs ,,	Fair to good flavour ..	£20 a £50
Chips ,,	Inferior to fine ...	£4 a £8
SAPANWOOD Ceylon ,,	Fair to good ..	£5 a £5 10s
Manila ,,	{ Rough & rooty to good	£4 10s a £5 15s
Siam ,,	bold smooth	£7
SEEDLAC cwt.	Ord. dusty to gd. soluble	[illegible]00s a 1[illegible]0s
SENNA, Tinnevelly lb	Good to fine bold green	5d a 1s 0¼d
	Fair greenish	3½d a 4¾d
	Common dark and small	1d a 3d
SHELLS, M. o'PEARL Bombay cwt.	Bold and A's / D's and B's / Small ...	£2 10s a £3 7s 6d
Mergui ,,	Small to bold ..	£6 7s 6d a £6 15s
Mussel ,,	Small to bold ..	22s a 55s
TAMARINDS, Calcutta...	Mid. to fine bl'k not stony	8s a 10s
per cwt. Madras	Stony and inferior ..	5s a 7s
TORTOISESHELL— Zanzibar & Bombay lb.	Small to bold dark mottle part heavy	16s a 28s
TURMERIC, Bengal cwt.	Fair .	18s
Madras ,,	Finger fair to fine bold bright	16s a 25s
Do. ,,	Bulbs ..	1[illegible]s a 18s
Cochin ,,	Finger ..	17s 6d a 18s
	Bulbs ...	12s 6d
VANILLOES— lb.		
Mauritius .. } 1sts	Gd. crystallized 3½ a 9 in	9s a 22s
Bourbon ... } 2nds	Foxy & reddish 3½ a 8 ,,	[illegible]s a 15s
Seychelles 3rds	Lean and inferior ...	5s a 9s
VERMILION lb.	Fine, pure, bright ...	3s 2d a 3s 8d
WAX, Japan, squares cwt	Good white hard ...	33s